July 16, 1956

How Electrons Move the Railroads . . . p. 36

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WORKBOOK OF THE RAILWAYS

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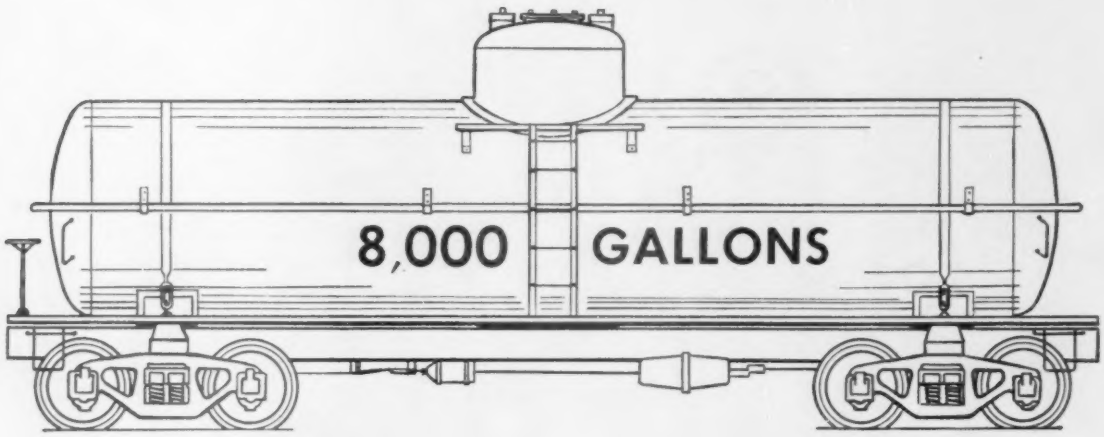

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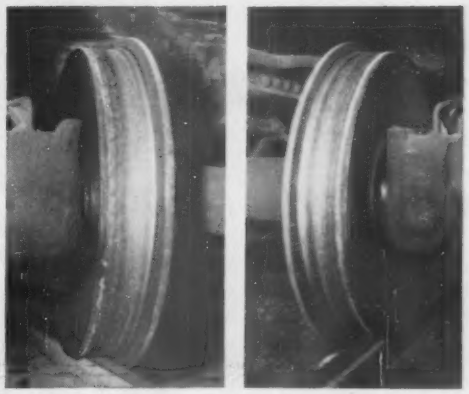

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Workbook of the Railways

Vol. 141, No. 3
July 16, 1956

CONTENTS and

Week at a Glance

Steel strike has hit railroads hard . . .

. . . but the worst may lie ahead if the shutdown continues much longer, a nationwide Railway Age survey shows. Carloadings are down, maintenance and construction jobs are being curtailed and car building schedules will be set way back if strike outlasts steel inventories. . . . p.7

Repeal of Section 22 provisions . . .

. . . authorizing special rates for government agencies is opposed by the railroads, but they favor modifications proposed by the Cabinet Committee. . . . p.8

Railroad management must decide . . .

. . . which comes first, service or economies, the B&O's G. Murray Campbell told the recent annual meeting of the AAR's Mechanical Division. J. P. Kiley, Milwaukee president, told the meeting that railroads have a great need for improved personnel communications. . . . p.10

FORUM: The highway bill—victory or defeat? . . .

. . . Gains for "user pays" principles are seen in the final form of the "big highway bill" recently enacted by Congress. This is particularly so in view of the country's long having been conditioned to accept socialistic practices in financing facilities for railroads' competitors. . . . p.35

How electrons move the railroads . . .

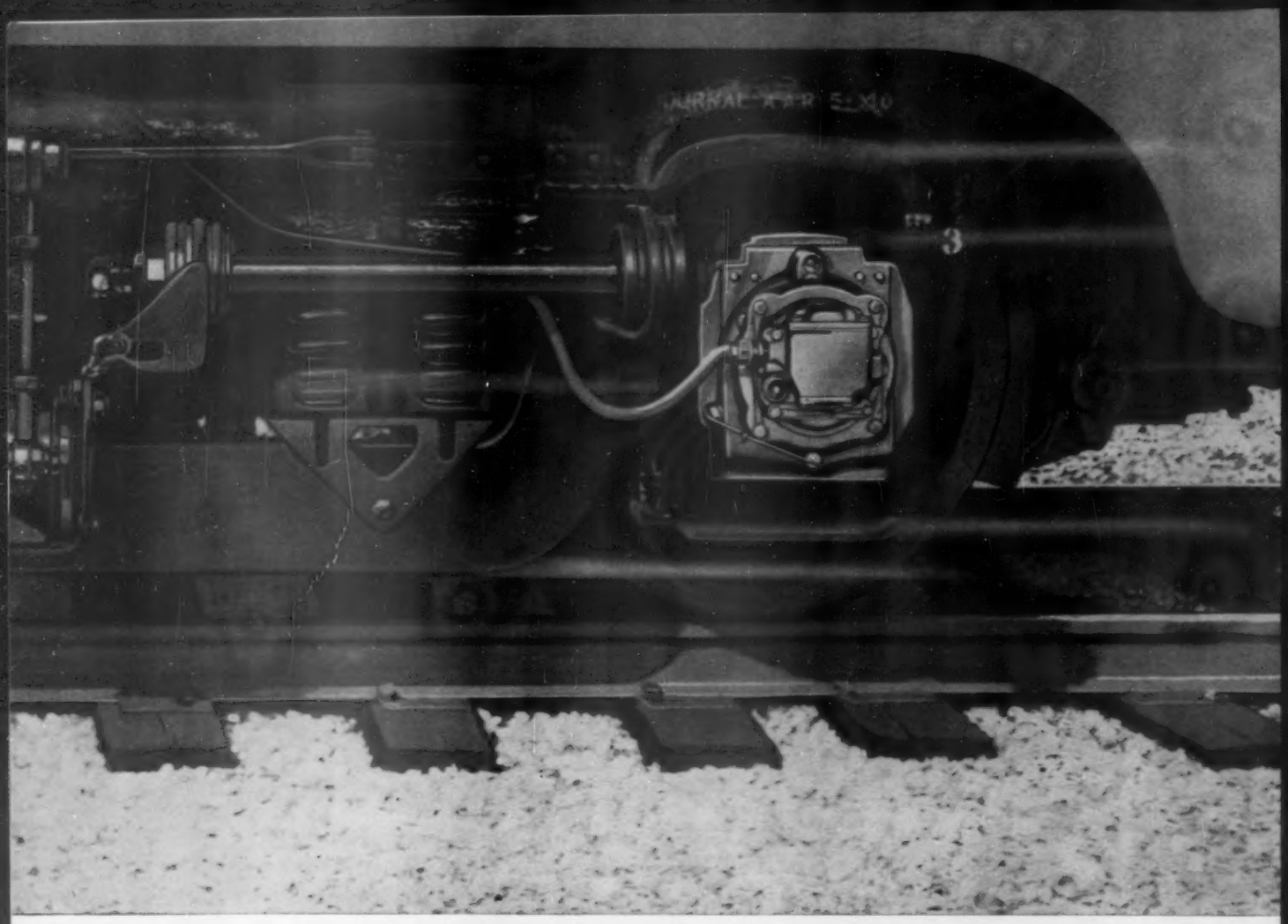
. . . in the present, and what the modern time- and cost-trimming electronic devices have in store for the railroads' future, is the subject of a comprehensive survey by John H. Dunn, this paper's Signal & Communications editor. . . . p.36

Making cost figures profitable . . .

. . . Although many data have no practical usefulness, "incremental costs" are a valuable tool for improving earnings, and they can be calculated inexpensively. . . . p.40

Getting set for bigger ore shipments . . .

. . . the Reading has completed the first part of an overall plan to move trains around the city of Reading on a new low-



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Current Statistics

Operating revenues, five months	
1956	$4,338,808,871
1955	3,956,975,949
Operating expenses, five months	
1956	$3,354,150,312
1955	3,007,441,074
Taxes, five months	
1956	$462,347,727
1955	421,778,876
Net railway operating income, five months	
1956	$415,532,086
1955	423,676,314
Net income, estimated, five months	
1956	$322,000,000
1955	328,000,000
Average price 20 railroad stocks	
July 10, 1956	102.93
July 12, 1955	96.40
Carloadings revenue freight	
Twenty-six weeks, 1956	18,927,412
Twenty-six weeks, 1955	17,880,094
Average daily freight car surplus	
Wk. ended July 7, 1956	23,583
Wk. ended July 9, 1955	9,073
Average daily freight car shortage	
W. end'ed July 7, 1956	4,435
Wk. ended July 9, 1955	11,961
Freight cars on order	
June 1, 1956	133,072
June 1, 1955	16,886
Freight cars delivered	
Five months, 1956	27,639
Five months, 1955	14,096
Average number railroad employees	
Mid-May 1956	1,061,972
Mid-May 1955	1,052,939

RAILWAY AGE IS A MEMBER OF ASSOCIATED BUSINESS PUBLICATIONS (A.B.P.) AND AUDIT BUREAU OF CIRCULATION (A. B. C.) AND IS INDEXED BY THE INDUSTRIAL ARTS INDEX, THE ENGINEERING INDEX SERVICE AND THE PUBLIC AFFAIRS INFORMATION SERVICE. RAILWAY AGE, ESTABLISHED IN 1856, INCORPORATES THE RAILWAY REVIEW, THE RAILROAD GAZETTE, AND THE RAILWAY AGE GAZETTE. NAME REGISTERED IN U. S. PATENT OFFICE AND TRADE MARK OFFICE IN CANADA.

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Week at a Glance CONTINUED

grade line. The seven yards in the area will be consolidated into one modern classification yard. . . . p.44

BRIEFS

A 6½-cent wage cut . . .

. . . that railroads have proposed for all non-operating employees is based on a railroad belief that last year's 16½-cent settlement, based on Emergency Board findings, went too far.

Increased demurrage charges . . .

. . . have been delayed until September 1. As reported in Railway Age of July 9, page 10, the tariff first had an August 1 effective date, thus surprising shippers who had expected that the higher charges would not be established until September 1. The latter date was then published in a tariff supplement, and the railroads have filed with the ICC a statement in justification of the proposed adjustment.

Tenth anniversary . . .

. . . of the standardized freight car and its components will be highlighted this week when a Pullman-Standard caravan of five such cars begins a nationwide tour. The caravan will visit St. Louis, where the Cotton Belt will accept delivery of the 75,000th PS1 box car, and then continue to St. Paul, Minneapolis, Chicago, Cleveland, Washington, D.C., Philadelphia and New York.

Cold turndown on the . . .

. . . Lackawanna's attempt to discontinue all passenger-train service on its so-called Boonton line in New Jersey has been made by the state Board of Public Utility Commissioners, which found "disposition of the case depends on proof of a need for the service with secondary consideration to financial aspects of the operation."

A "super-bus" for the BAR . . .

. . . has been introduced to carry passengers, mail and railway express on the Oakfield, Me.-Fort Kent branch line. Similar to units used for two years by the Northern Pacific Transport Company, the bus was built by Crown Body & Coach Co., Los Angeles. It uses 200 hp diesel engine and seats 20 riders in space separated from 20-ft cargo section in rear.

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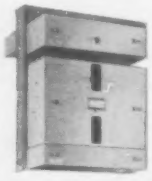

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TONNAGE, CAR ORDERS HIT AS . . .

Steel Strike Blurs RR Outlook

The number one question on the railroads as this issue of Railway Age went to press was: "How long will the steel strike last?"

Already, the two-week-old labor dispute has cut deep into freight volume on many roads and forced railroad shops and car builders to put the yardstick on their steel inventories.

What became starkly apparent last week as the news staff of Railway Age conducted a national survey to determine how the strike is affecting the railroads, was that so long as steel furnaces remain cold, conditions can only get worse.

First impact of the halt in steel production was felt by the roads directly serving steel companies either by supplying them with coal, ore or limestone or by hauling steel from the mills to fabricating plants. How severe this initial blow was may be judged from a report from the American Iron & Steel Institute which estimated that just 312,000 tons of steel would be produced in the United States the week of July 9 as against 2.3 million tons in the second week in June and 2.2 million tons in the same week last July.

Statistics from individual roads make the situation even more serious: The Pennsylvania, a third of whose business depends on steel, laid off 18,000 employees and suspended two mid-western passenger trains for economy reasons; the Lake Superior & Ishpeming reported its operations had been curtailed 85%; the Illinois Central said it has steel to build only 160 cars, leaving its plans to build 1,164 more cars this year up in the air; the Erie has 1,350 freight cars on order "which will probably be moved back," the Frisco reported that "bridge and rail programs will be badly delayed" in a prolonged shutdown; the Kansas City Southern anticipates "substantial reduction in service and force," in a continuing strike.

But, again, how long will the shutdown be?

Could Be a Long One—With neither side indicating any weakening of positions that led to this "strike that nobody wanted," and the government confining its intervention to conciliation efforts, it looks like the strike could be a lasting one.

If that is the case, even roads like the Southern Pacific, Union Pacific, Santa Fe, New Haven, Milwaukee

The Strike Picture—Road by Road

ACY . . .
Business off 17%, no layoffs, big problems if strike runs past Labor Day.

B&O . . .
Furloughed 5,000 employees, will delay less important construction jobs.

C&O . . .
Coal miner's holiday delayed effects of strike; export moves to ease expected slump.

C&EI . . .
Automobile traffic still holding up but long strike will hurt.

C&NW . . .
Ore business—20% of total traffic—is almost nil.

D&RGW . . .
Loss of vital steel volume painful but good business elsewhere reduces effect.

DSS&A . . .
"Iron ore operations at virtual standstill;" car repair and bridge programs hampered.

ERIE . . .
Loadings cut 20%; lengthy strike means economies, delayed construction and maintenance.

IC . . .
"In better shape than a lot of roads;" anticipates $3,325,000 revenue loss in 60-day strike.

SOO LINE . . .
Ore traffic "a dribble;" expects RRs to get "short end of stick" in post-strike steel allocation.

NYC . . .
Reports "thousands" laid off; could give no further evaluation of strike.

N&W . . .
Coal loading cut 25%—more in long strike; car building, other projects threatened.

PRR . . .
Steel industry normally accounts for 30% of business; management paychecks slashed 10%.

RDG . . .
Estimated loss: 766 cars, $72,000 daily; rail laying, new cars to be delayed length of strike.

VIRGINIAN . . .
"Overall traffic reduced approximately 25%"

and Lackawanna—which all report only minimum initial side-effects—will begin to hurt. As steel inventories dry up, most manufacturers must cut back production, and, as production goes, so go carloadings.

These roads that have not yet been hard-hit readily admit they cannot dodge the impact of a long strike, an SP spokesman noting that one "could eventually curtail operations and seriously affect car construction, etc." "Prolongation will affect us more and more" a New Haven officer relates while from the UP comes word that an extended shutdown will result in layoffs in addition to 700 already furloughed, mostly in the car departments.

Near-record car building programs—both in company shops and in private plants—are seriously affected by the impending steel shortages and, while most roads and builders report inventories to carry them for some time, a strike of six weeks or two months duration would set these programs back severely.

Pullman Standard says that its Bessemer plant has already been closed because of the strike at Tennessee Coal & Iron although there is reported "enough steel on hand to complete orders" at the Chicago plant. Pullman-Standard plants at Michigan City and Butler, however, have been operating at 60% of capacity because of steel scarcity and "will start to cut down fabricating operations on July 23 and will ship the last completed car in the middle of August."

Varying conditions mark the industrial builders' situations, with Greenville Steel Car Company reporting it expects to close down its first track August 9 and the second August 17. "All workmen" will be laid off August 17, this company reports, and it "will not resume until strike is settled and sufficient steel [is] on hand to resume operations." The Budd Company reports a six-week supply of stainless steel and is working normally.

Every day of the strike will cost one day's production at ACF Industries, J. F. Clark, president, said recently (Railway Age, June 25, p. 12) and a company spokesman, assuming a lengthy shutdown, confirms this estimate now.

"We are still working but we don't know how long we will continue; maybe up until the middle of August," was the reply General American Transportation Company made to the Railway Age inquiry, summing up the prevailing uncertainty.

Locomotive Builders — Alco Products, Inc.—idle to July 23 for annual vacations—announced it can fulfill commitments through September while Fairbanks-Morse said it has enough steel to keep it going to mid-August.

"A comfortable 45-day inventory" of steel as of July 1, was reported by the Electro-Motive Division, General Motors Corporation, while Baldwin-Lima-Hamilton has enough steel to "meet requirements."

"Havoc," is the way the Elgin, Joliet & Eastern, summed up the effect of the strike on its operations, and this apparently is typical of the steel-company roads like the Bessemer & Lake Erie, Birmingham Southern and the Duluth, Missabe & Iron Range, the last of which reported its tonnage down 90%.

Complicating things for the Birmingham Southern—and also the Louisville & Nashville and Frisco—is the unrelated 10-week TC&I strike at Birmingham.

Ore-haul roads like the Great Northern and Northern Pacific are among the most seriously affected by the national strike.

No effect on car building programs as yet was reported by the Nickel Plate and Western Maryland while the C&O estimated it could keep its fabricating shops going until mid-August and its car repair shops for two or three weeks thereafter. Effect on coal loadings had not yet been fully evaluated by the Chesapeake & Ohio and others because of the annual miners' holiday coinciding with the strike, but loss of this business was expected to amount to a sizeable blow, despite growing export business which will help soften the impact of the strike, for the C&O, Virginian and Western Maryland.

Roads Would Keep Section 22 Freedom

Oppose repeal of provisions authorizing special rates for government agencies, but favor modification of such provisions along lines recommended by Cabinet Committee

The railroad industry opposes repeal of those provisions of the Interstate Commerce Act's section 22 which authorize special rates for government agencies.

That stand was taken by the board of directors of the Association of American Railroads at its meeting in Washington last month. The AAR does favor, however, modification of section 22 along lines recommended by President Eisenhower's Cabinet Committee on Transport Policy and Organization.

To that end the association is suggesting amendments to the bill, H.R. 525, calling for repeal of the special-rate provisions which has been reported favorably from the House Committee on Interstate and Foreign Commerce. The bill, sponsored by Representative Hinshaw, Republican of California, would remove government agencies from section 22's list of those eligible to receive rate concessions.

Shipper Position — Shippers generally favor the Hinshaw bill. As to that, the House committee's report on the bill said the present provisions of section 22 result in discrimination in favor of the government. Support of the bill by the National Industrial Traffic League was cited as evidence that shippers "are conscious of this discrimination."

The AAR position is that the bill should not pass without amendments which, in effect, would convert it from a repealer into a modifier. The association's proposal is that the reference to government agencies be eliminated from the present section 22 and that this section be renumbered as section 22(a).

The proposal goes on to suggest addition of a paragraph (b) which would authorize the establishment of rates and rules "of special application" for transportation service to government agencies. Such rates would be subject to all provisions of the act, except that they could not be suspended by the Interstate Com-

(Continued on page 10)

RAILWAY MARKET OUTLOOK THIS WEEK

a RAILWAY AGE Workbook Page

Steel Strike Slashes Carloadings.—Loadings of revenue freight in the week ended July 7 totaled 478,297 cars, the Association of American Railroads announced on July 12. This was a decrease of 276,995 cars, or 36.7%, compared with the previous week; a decrease of 170,695 cars, or 26.3%, compared with the corresponding week last year; and a decrease of 91,265 cars, or 16.0%, compared with the equivalent 1954 week. The drop in carloadings may be attributed to the steel strike, the coal miners' "holiday" and the July 4 holiday.

Loadings of revenue freight for the week ended June 30 totaled 755,292 cars; the summary, compiled by the Car Service Division, AAR, follows:

REVENUE FREIGHT CAR LOADINGS

For the week ended Saturday, June 30

District	1956	1955	1954
Eastern	123,104	120,199	100,743
Allegheny	141,708	132,409	103,309
Pocahontas	49,588	25,459	20,789
Southern	116,705	105,302	101,018
Northwestern	130,138	127,087	115,341
Central Western	130,535	124,529	121,159
Southwestern	63,514	60,856	56,200
Total Western Districts	324,187	312,472	292,700
Total All Roads	755,292	695,841	618,559
Commodities:			
Grain and grain products	66,472	65,457	66,331
Livestock	5,831	5,171	5,894
Coal	106,132	40,220	30,022
Coke	10,806	10,200	7,149
Forest Products	48,557	46,015	34,181
Ore	81,577	81,429	72,327
Merchandise l.c.l.	59,977	68,545	61,231
Miscellaneous	375,940	378,794	341,424
June 30	755,292	695,841	618,559
June 23	799,461	794,427	713,160
June 16	801,431	779,957	707,237
June 9	787,075	781,938	697,583
June 2	719,209	709,351	612,314
Cumulative total, 26 weeks	18,927,412	17,880,094	16,501,826

In Canada.—Carloadings for the seven-day period ended June 21 totaled 92,991 cars, compared with 93,862 cars for the previous seven-day period, according to the Dominion Bureau of Statistics.

	Revenue Cars Loaded	Total Cars Rec'd from Connections
Totals for Canada:		
June 21, 1956	92,991	34,188
June 21, 1955	87,349	31,643
Cumulative Totals:		
June 21, 1956	1,982,513	848,787
June 21, 1955	1,773,571	768,478

New Equipment

FREIGHT-TRAIN CARS

► *New Car for Piggyback.*—"Lodapto," new car that is 10 in. lower than standard railroad flat car, has been announced by ACF Industries; car, described as a version of multi-purpose "Adapto" car announced by ACF early this year, is designed to make piggyback traffic possible through low-bridge areas; cost will be "substantially less" than that of conventional flat car.

► *Erie.*—Ordered 300 70-ton steel gondola cars, Greenville Steel Car; estimated cost $2,500,000; delivery expected to start next May.

► *Virginian.*—Ordered materials for construction in Princeton, W. Va., shops of 1,000 70-ton steel hopper cars; work scheduled to begin about May 15, 1957.

► *May Repair Ratio (A Correction).*—Tabular comparison of car ownership and cars awaiting repairs in repair ratio item of June 25, page 9, gave one listing under the erroneous column heading May 1, 1954. The heading should have read May 1, 1956.

Purchases and Inventories

► *Four Months' Purchases Up $197 Million.*—Purchases by domestic railroads of all types of materials in first four months of 1956 were $196,721,000 above those for same period last year; Railway Age research department prepared following tables:

PURCHASES*	April 1956	Four Months 1956	Four Months 1955
	(000)	(000)	(000)
Equipment **	$ 70,100	$180,603	$150,375
Rail	9,597	38,119	33,684
Crossties	7,345	25,404	17,582
Other Material	114,767	448,265	290,908
Total from Manufacturers	$201,809	$692,391	$492,549
Fuel	35,685	148,353	151,474
Grand Total	$237,494	$840,744	$644,023

* Subject to revision.
** Estimated value of orders.

INVENTORIES*†	Apr. 1, 1956	Apr. 1, 1955
	(000)	(000)
Rail	$ 58,058	$ 50,614
Crossties	99,210	114,109
Other Material	520,570	487,382
Scrap	20,380	16,000
Fuel	27,340	31,525
Total	$725,558	$699,630

* Subject to revision.
† All total inventory figures taken from ICC statement M-125 for month indicated.

New Facilities

► *Minneapolis & St. Louis.*—Will begin constructing this summer a new freight and passenger station at Mason City, Iowa ($35,000).

(Continued from page 8)
merce Commission and provisions of section 4 would not apply.

Provisions as to publication, however, would include the right to publish on short notice, for retroactive application, and to obtain waiver of filing requirements "where the security of the United States so requires."

The railroad position in opposition to ending their authority to grant special rates to government agencies is consistent with their support of the Cabinet Committee's rate-freedom proposals. Section 22, which is merely permissive, affords carriers freedom to compete for government traffic. The AAR's general attorney, William M. Maloney, has put it this way:

"Only in the making of rates for government traffic under section 22 do the railroads enjoy the same rights, privileges, and exemptions as do their competitors. Repeal of section 22 without other material changes in the scheme of regulation would deprive the railroads of their one area of complete competitive equality in rate making. If the railroads could no longer quote rates under section 22, they would immediately be subject to the same disadvantages in their competitive rate making for government traffic as they are now subject to in their competitive rate making for commercial traffic generally."

Which Comes First—Service or Economies?

Railroads must decide, Campbell tells Mechanical Division —Kiley urges better personnel communications

Railroads have two possible courses in dealing with the public, Baltimore & Ohio Vice-President G. Murray Campbell told the AAR Mechanical Division at its recent annual meeting in Chicago.

"Will railroad management give patrons what they wish in dependable transportation at the price they want to pay?" he asked. Or will it "set its sights toward economies and expect the patrons to subscribe to the type of service the railroads decide to give?"

Mr. Campbell warned that railroads must not expect the public to feel sorry for them and to give them preferred status because of past contributions to development of the nation.

Whether the industry thinks its competition is fair or unfair, he declared, "it is plainly evident that railroads have to present a more convincing story than they do now to win public recognition of what is fair play." The "whine of petulance will not accomplish this," Mr. Campbell went on. "It has been tried. The railroads must prove what they have to sell is liked by the patrons. The patrons will support what they like."

Loss & Damage Culprit—Turning to car design concepts, Mr. Campbell pointed his finger at the conventional freight car as the villain in 1955's $93 million loss and damage figure, of which 80% was for unlocated and concealed loss and damage.

"There is much opportunity" he said, to "provide better trucks and springs and snubbers and draft gear to minimize vibration in fast trains. Slack shocks in long trains are vigorous, and certainly can be reduced. It seems reasonable to assume that modern car design can permit switching impacts of 10 mph without lading damage or car strain."

A final suggestion from the B&O vice-president was for a letter code prefix before the number to identify each type of car readily without recourse to the equipment register.

J. P. Kiley, Milwaukee president, told the opening session of the AAR meeting that the increasing complexity of railroad operation makes it necessary to develop personnel with adequate technical training. Upgrading of the railroad labor force because of these new technologies makes high-quality supervision imperative, he said.

Improved communications "between employees and all levels of the management group" is another industry problem, the Milwaukee president said.

Mr. Kiley attributed it to "the size of industrial organizations and the upgrading of the labor force" and added that "when most labor was done by hand, such communication was perhaps less necessary because each man's area of work was small.

"Today . . . a single individual may be operating a device worth thousands of dollars . . . Under these circumstances, orders only half understood, or ignorance of the purpose of the work could lead to disastrous mistakes. Much of the work, also, is of a highly technical nature which requires good understanding between worker and supervisor to be properly executed."

Calling attention to an experiment in "participative management" in another industry, Mr. Kiley said it had been reported that "people support what they help create" and that "problem-solving can be improved by bringing to bear on any problem all possible human resources, regardless of where they are found."

Radio for Redcaps

Quicker communications are made possible through use of this portable radio transmitter being tested by the New York Central in Cleveland Union Terminal. Chief Stationmaster A. J. Kuntz (above), shows how calls for extra porters or baggage trucks or other information can be relayed from trainside or other points to a receiving station where message is put on public address system. NYC, using three such transmitters, reports they have an effective range of one mile.

Fire Losses Reach An All-Time High

The total of 5,687 railroad fires reported during 1955 caused an all-time record high of $13,050,970 in losses on United States and Canadian railroads.

The 1955 experience is an increase over 1954, both in the number of fires and the amount of the losses, according to the AAR's Fire Protection and Insurance Section.

Cotton fires caused losses amounting to $1.8 million, or 14% of the total, more than any other known cause. Losses from fires of unknown origins amounted to $2.9 million, or 22% of the total loss.

AAR Accounting Division Starts Textbook Series

The first textbook of a proposed series designed to show railway accounting principles correlated with the physical work of railroading has been issued by the Accounting Division of the Association of American Railroads.

The textbook, entitled "Working on the Tracks," is an illustrated paper-bound book of 82 pages. It was prepared for the Accounting Division's Committee on Disbursement Accounts by B. H. Moore, assistant to the AAR vice-president in charge of its Finance, Accounting, Taxation and Valuation Department. It deals with building and maintenance of roadbed and tracks.

Mr. Moore, in the preface, expressed his hope that the textbook "will be of service to beginners in the accounting department in understanding the application of railroad accounting rules and principles as they pertain to track maintenance." Copies, at $1 each, may be obtained from the AAR Accounting Division, 330 Transportation Building, Washington 6, D. C.

Kelly Leaves RRB For Federal Judgeship

Raymond J. Kelly, chairman and "public" member of the Railroad Retirement Board, has been confirmed by the Senate for a judgeship in the federal district court at Juneau, Alaska. The Senate's action ratified President Eisenhower's appointment of Mr. Kelly.

Shiny Bright Cars Swell B&M Fleet

Sporting bold new emblem, string of Boston & Maine cars joins road's fleet at Somerville yard. They are among first of 2,000 roller bearing cars ordered in road's current $35 million expansion program, and are painted brilliant blue. B&M says it will have largest percentage of roller bearing freight cars of any railroad in country when complete order is received.

Atlantic Port Rate War Halted

The Board of Suspension of the Interstate Commerce Commission has halted a railroad rate war by suspending tariffs which proposed cuts in rates to Atlantic ports. The tariffs, published to become effective July 10, were suspended until February 9, 1957, and they will be investigated in a proceeding docketed as I&S No. 6615.

The competitive cuts started when railroads serving ports from New York north to and including St. Johns, N.B., proposed to reduce their charges and thus equalize their port rates with those of roads serving ports south of New York to and including Hampton Roads (Railway Age, May 7, p. 56).

Railroads serving the latter ports then published like cuts in order to maintain their present differentials, which amount to about three cents per 100 lb.

ICC Won't Reopen Class Rate Case

The Interstate Commerce Commission has dismissed petitions filed a year ago by western and Southwestern railroads which sought to have the 28300 class rate case reopened for further hearing.

Petitioners based their plea on fears they would lose some $22.5 million in annual revenue if they are required to provide for alternation of their commodity and exception rates with the new class rates (Railway Age, July 18, 1955, p. 9). The class rates, as now published by the petitioners, do not provide for alternation; but many of their commodity and exception rates are higher than the class rates. They have also been concerned about the commission's ruling in *Page Belting Co. v. Boston & Maine*, which held that a commodity rate or exception rate higher than a class rate was unreasonable to the extent it exceeded the class rate.

The commission's order denying the petition said new evidence which petitioners proposed to offer would not justify any change in the 28300 scale.

The scale has been in effect since May 30, 1952.

German-Made Road Switcher Debuts on CNR

Being tested on Canadian National lines is this 750 hp diesel-hydraulic road switcher made by Maschinebau Kiel Aktiengesellschaft company of Kiel, West Germany. It is 37 ft long, 9½ ft wide and 13 ft high. The "MaK" engine is connected to a hydraulic coupling which serves, in effect, as a fluid reduction gear that alters engine torque to suit varying conditions of service. Power is transmitted from hydraulic coupling to driving wheels by shafts and gears. Other Canadian roads will test engine after CNR trials with it have been completed.

CNJ Starts T-O-F-C; DL&W Expands it

Piggyback service has been inaugurated by the Jersey Central, linking 35 points in the New York-New Jersey metropolitan area with eight midwestern cities, it was announced by H. W. Dorigan, vice-president, traffic.

Routed via the Reading and the Baltimore & Ohio, the CNJ "Trailer-Rail" operation provides second-morning service between New York and Chicago and St. Louis. Other cities reached by the service include Cincinnati, Cleveland, Indianapolis, Louisville, Toledo and Youngstown. Mr. Dorigan said the service may later be extended to other points.

Extension of the Lackawanna's piggyback service to the Borough of Queens in New York City and to Long Island City—delayed for several weeks by litigation—went into effect July 6, it was announced by the railroad.

16 RRs Paid Safety Fines in May

Thirteen railroads paid fines in May totaling $7,600, plus costs, on 76 counts for violations of the Safety Appliance Acts. This was reported by the Interstate Commerce Commission, which also reported May fines totaling $400 paid by two roads for violations of the Hours of Service Law and a $500 payment on five counts for violations of the Accident Reports Act.

Fines paid for violations of the Safety Appliance Acts included payments of $1,000 or more by four roads—$1,600 by the Nickel Plate, $1,400 each by the Pennsylvania and Texas & Pacific, and $1,000 by the Conemaugh & Black Lick. The fines for violations of the Hours of Service Law were paid by the Terminal of St. Louis ($300) and the Baltimore & Ohio ($100). The $500 fine for violations of the Accident Reports Act was paid by the New York Central.

New Mountain-Pacific Rates Again Delayed

September 1 is now the effective date of the class-rate changes prescribed by the Interstate Commerce Commission in the Mountain-Pacific phase of its uniform class-rate program.

The changes were previously scheduled to become effective August 1. Rates involved are the class scales applicable within Mountain-Pacific territory and inter-territorially in both directions between that territory and other sections of the country (Railway Age, June 25, p. 11).

March Accidents

The ICC has made public its Bureau of Transport Economics and Statistics' preliminary summary of railroad accidents in March and this year's first three months. The compilation, subject to revision, follows:

Item	Month of March		3 months ended with March	
	1956	1955	1956	1955
Number of train accidents*	832	680	2,378	1,992
Number of accidents resulting in casualties	47	36	136	114
Number of casualties in train, train-service and nontrain accidents:				
Trespassers:				
Killed	56	43	144	132
Injured	56	50	144	141
Passengers on trains:				
(a) In train accidents*				
Killed	..	..	43	..
Injured	6	11	399	131
(b) In train-service accidents				
Killed	2	..	4	2
Injured	123	131	419	410
Travelers not on trains:				
Killed	..	..	1	3
Injured	73	72	245	265
Employees on duty:				
Killed	15	20	63	58
Injured	1,582	1,374	4,611	4,027
All other nontrespassers:**				
Killed	157	112	394	378
Injured	489	490	1,525	1,514
Total — All classes of persons:				
Killed	230	175	649	573
Injured	2,329	2,128	7,343	6,488

*Train accidents (mostly collisions and derailments) are distinguished from train-service accidents by the fact that the former caused damage of $575 or more to railway property. Only a minor part of the total accidents result in casualties to persons, as noted above.

**Casualties to "Other nontrespassers" happen chiefly at highway grade crossings. Total highway grade-crossing casualties *for all classes of persons, including both trespassers and nontrespassers*, were as follows:

Persons:				
Killed	144	101	383	349
Injured	349	336	1,075	1,095

Landry Is ODM Transport Chief

George A. Landry is now the Office of Defense Mobilization's assistant director for transportation, a new position.

He has assumed responsibilities formerly discharged by the coordinator of defense transportation, a post which had been vacant for some time. Mr. Landry has been with ODM since April 1954, coming from the Western Electric Company where he was vice-president in charge of the Purchasing and Traffic Division.

Supply Trade

Dow Chemical Company has formed a wood and construction section to develop applications for both new and established chemicals in the wood and construction fields. It will also handle sales service on products used in wood treatment. **George E. Olson,** formerly with Dowicide sales, will head the new section.

Hydraulic Press Manufacturing Company has been merged with **Koehring Company** through an exchange of stock, and will be operated as a Koehring division.

Jack P. Greer has been promoted to mid-central district manager of **Hyster Company,** succeeding **Walt St. Clair,** recently made assistant sales manager, eastern division.

Lewis C. Black, assistant eastern district manager, **Bucyrus-Erie Company,** New York, has been appointed sales manager-large machines, at South Milwaukee, Wis.

Charles Bruning Company has been appointed nationwide dealer, for Verifax copying machines and materials, by **Eastman Kodak Company.**

National-U. S. Radiator Corporation has acquired the air conditioning division of **Union Asbestos & Rubber Company.**

L. B. Foster Company has expanded its Houston operations by appointing **Ray Laden** district sales manager there, and moving to larger offices in the Bank of the Southwest Building.

Karl W. Galliger has been appointed director of engineering of the **New York Air Brake Company,** at New York. He was formerly engineering manager of the company's Watertown division.

RAY MACK, general manager, Locomotive Crane Division, Wellman Engineering Company, who has been elected vice-president of the division.

CHESAPEAKE & OHIO.—A. Witt Hix, chief purchasing and stores officer, Cleveland, named vice-president—purchases and stores at that point.

Railway Officers

ALASKA. — All operating functions of this government-owned road have been combined in one department, under a reorganization plan approved by the Department of the Interior. **R. H. Bruce** appointed general superintendent of operations in charge of communications, engineering, transportation and motive power and equipment—these departments designated "branches" of the new operations division.

L. P. Draney, comptroller, heads the new administrative division, which includes the stores and purchases department (redesignated the property and supply branch), and the accounting division (redesignated accounting branch). The administrative division will provide all "office services" for the road, will take charge of custodian, mail and messenger services, and headquarters files. The division also will include the budget, auditing and records management offices.

Main divisions of the road, besides operations and administrative, include legal (real estate and contract), personnel and traffic. Heads of these divisions include **George R. Hise,** general counsel, who is assigned to the road from the solicitor's office of the Interior Department; **Paul Shelmardine,** personnel officer, and **E. J. Kunz,** general traffic manager.

R. N. Whitman and **John E. Manley** continue as general manager and assistant general manager, respectively. The title of **Jerome Sheldon,** advertising agent, changed to public relations officer. **C. J. Evey,** special assistant to general manager, named superintendent, transportation branch, succeeding Mr. Bruce as head of the former operations department. Mr. Evey will be responsible for movement of all freight and passenger trains and operation of depots and freight houses from Seward to Fairbanks. **Harry F. Jones,** assistant personnel director, named assistant to general superintendent of operations. **Bernadine Prince,** secretary to comptroller, named administrative assistant to comptroller in charge of office services.

E. Ralph Sanders, district freight and passenger agent, promoted to assistant general traffic manager. Mr. Sanders is the liaison with military transportation officers in Alaska, and arranges for movement of troops and military freight. Title changes include those of **J. W. Miles,** from superintendent of stores and purchases, to property management officer, and **W. F. Radke,** from accounting officer to assistant comptroller. **Jack Fouch,** valuation engineer, engineering department, becomes office engineer on Mr. Bruce's staff.

I. P. Cook, chief engineer, **Frank W. Shellhorn,** superintendent of communications and **Gerald V. Randall,** superintendent of motive power and equipment, will continue to be in charge of their respective branches.

FRISCO.—Gordon L. Oliver, freight traffic manager at St. Louis, retired June 1.

R. L. Akins appointed safety supervisor, Tulsa, Okla.

J. W. Mahanay

J. W. Mahanay, director of development at St. Louis, appointed assistant to vice-president, traffic, at that point.

Sam Frevert, industrial engineer, St. Louis, transferred to Tulsa, Okla.

OBITUARY

Edward G. Walker, 85, retired assistant general purchasing agent of the **Santa Fe,** died July 6.

Henry B. Spencer, 83, retired president of Fruit Growers' Express Company, died at his home in Narragansett, R. I., July 4.

Joseph J. Byrne, 87, retired vice-president—traffic of the Lackawanna, died at his home in West Orange, N. J., July 2.

A Message to Management . . .

One major repair instead of two

After 18 years of service . . . USS COR-TEN Steel lightweight car ready for first major repairs.

Lightweight hopper cars prove the durability of USS COR-TEN Steel construction

Shown above is one of 50 lightweight 70-ton hopper cars purchased by the Duluth, Missabi and Iron Range Railway in 1937. These cars were constructed with USS COR-TEN Steel body sheets, ⅛" thick on the sides and 3/16" thick on the floors.

These cars were examined in June, 1950, at which time it was estimated that the side sheets would last 2 more years, and the floors at least 2 to 3 more years. But the cars did better than that.

Now, after 18 years of service hauling mostly coal, limestone and general steel mill lading, the body sheets of these cars are being replaced for the first time.

We consider this exceptionally good performance, especially when you contrast it with hopper cars built of heavier carbon steel sheets (3/16" thick sides and ¼" thick floors) which in similar service on this railroad lasted only 7 to 8 years.

Ready for at least 18 years more service . . . after rebuilding with USS COR-TEN Steel.

when cars are built of COR-TEN steel

USS COR-TEN Steel's longer life assures big savings in maintenance costs

The continually rising cost of freight car repairs—up 453% since 1932—has brought sharply into focus the need for building or rebuilding freight equipment to secure stronger, more durable body construction that will require the least amount of maintenance.

Construction with USS COR-TEN High Strength Steel provides a practical solution to this problem.

The economic soundness of building with this high strength, corrosion resisting steel has been thoroughly demonstrated. During the past twenty years, leading railroads have established the fact that in hopper cars, for example, every additional dollar spent for USS COR-TEN Steel pays off in a clear saving of from three to six dollars in repair costs.

That's because USS COR-TEN Steel used in the same thicknesses in place of copper steel will increase the life of body sheets by at least 50%.

This means that over the 36 years' normal life of a car you need pay for *only one heavy repair instead of two.* The results are a *clear* saving in maintenance costs of from $800 to $1500 per car, depending on the type, capacity and service conditions.

What's more, by eliminating one heavy repair, your time-out-of-service, waiting for repairs, is cut in half. This will provide substantial additional savings when you consider that the average revenue per serviceable car is now $11.33 per day.

Profit-building advantages like these are the reasons why many American railroads are continually increasing their use of USS COR-TEN Steel, both for new equipment and for repairs. We welcome the opportunity to show you how this performance-tested steel can be used to pay equally desirable dividends in your equipment.

See "THE UNITED STATES STEEL HOUR"—Televised alternate weeks—Consult your newspaper for time and station.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

UNITED STATES STEEL

Questions and Answers

Of current interest to the Transportation Department

Should roads be subjected to penalty for failure to report—or for incorrectly reporting—cars delivered in interchange . . .

?

No. Receiving road should check.

It has been suggested that a penalty charge be made for errors or omissions in interchange reports of cars delivered to connecting lines, to obtain accurate reports for per diem purposes. Would such penalty charges be practical, or would the paperwork defeat the purpose?

"If the receiving line checks the interchange, proper corrections will be made. Furthermore, the recording of errors entails additional paperwork which everyone is endeavoring to cut down at this time."—*Eastern Association of Car Service Officers.*

(Question and reply would seem to suggest that some roads may be taking "short cuts" and are not checking interchange received. If this is so, I wonder if any money is saved thereby, in view of the added burden thrust on the car accounting office?—G.C.R.)

Should per diem rules be revised so that all roads participating in a loaded car movement be assessed a minimum of one day's per diem . . .

?

No. Why penalize prompt movement?

There are many railroads in the United States, Canada and Mexico that, while contributing to the wear and tear of freight car equipment, receive and deliver cars at interchange points the same day. As a result, they pay no per diem for the use of such cars. Diesel locomotives have resulted in speedier handling and, consequently, many cars are handled several hundred miles the same day. Because such lines usually receive a sizeable division of the freight revenue, would it not seem that there should be a minimum payment of one day's per diem, except on cars handled in terminal or intermediate switching service?

"No change in the per diem structure with respect to 0 day cars is recommended. With the present shortages and demand for all type cars, it is essential that all cars loaded and empty be moved promptly to their destination on line or to their connections and no road should be penalized for so doing."—*Eastern Association of Car Service Officers.*

Is the switching carrier entitled to a switching reclaim when a car loaded on the switching line moves outside the switching limits for unloading on another line . . .

?

Yes. Terminal switching is performed.

Road A furnished road B with an empty car for partial loading at an industry on road B, within the switching limits of station X. Car was partially loaded by B and returned to A at X. Road A then delivered car to road C at station X for completion of loading on its line, within the switching limits of station X. After loading was completed, road C returned car to A at X for its road haul. Road A collected a stop-off charge.

Road A claims the switching performed by road B was inter-terminal switching and that no reclaim is due under rule 5. Road B considers the car was in terminal switching service for A, the road haul carrier, and that reclaim under rule 5 is in order. The rate received by B for its service was the regular terminal switching rate. Road B's view is that the car was not in inter-terminal switching service because it was not loaded and unloaded within the same switching limits. The load placed in the car on road B's rails was for road haul by road A. Is B entitled to its terminal switching reclaim?

"Road B is entitled to its terminal switching reclaim. The service performed by road B is terminal switching as defined in appendix A of the code of switching reclaim rules and road B received the terminal switching rate. The car was not unloaded within the switching limits of station X. It was partially loaded on road B and delivered to A for completion of loading on road C. Thus B became the terminal switching road."—*Eastern Association of Car Service Officers.*

CONDUCTED By G. C. RANDALL, district manager, Car Service Division (ret.), Association of American Railroads, this column runs in alternate weekly issues of this paper, and is devoted to authoritative answers to questions on transportation department matters. Questions on subjects concerning other departments will not be considered, unless they have a direct bearing on transportation functions. Readers are invited to submit questions, and, when so inclined, letters agreeing or disagreeing with our answers. Communications should be addressed to Question and Answer Editor, Railway Age, 30 Church Street, New York 7.

PULLMAN-STANDARD *Invites You*

TO VISIT AND INSPECT THE P-S STANDARDIZED FREIGHT CAR CARAVAN

PULLMAN-STANDARD
PS-1
TENTH ANNIVERSARY
1956
CAR MANUFACTURING COMPANY

to be displayed in EIGHT cities during July, August and September

ST. LOUIS, ST. PAUL, MINNEAPOLIS, CHICAGO, CLEVELAND, PHILADELPHIA, WASHINGTON, D. C., NEW YORK

Part of the PS-1 Box Car's Tenth Anniversary Celebration

THE STANDARDIZED P-S

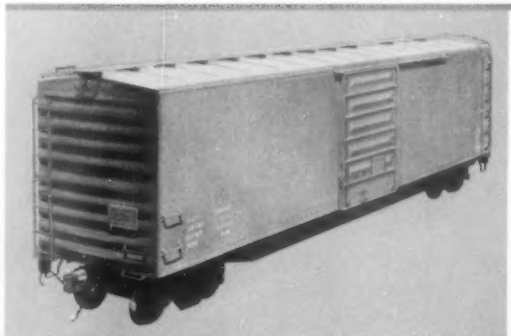
What the P-S Caravan will Feature . . .

1—THE 75,000TH PS-1 BOX CAR.

Brand new from Pullman-Standard's production lines is the 75,000th PS-1 Box Car built since the introduction of the Standardization concept in 1946. This eye-catcher blazes with the well-known Blue Streak which indicates it is owned by the famed Cotton Belt. A 40'-6" PS-1, this car will be of special interest to you because of the basic design flexibility which allows this Standardized PS-1 to fill buyer specified requirements.

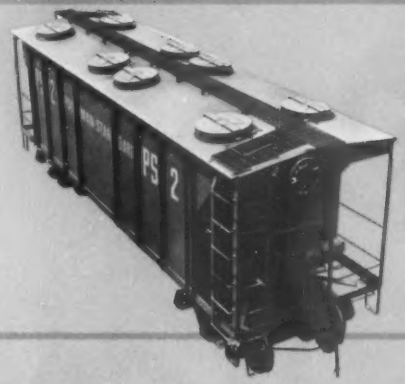
2—PS-1 BOX CAR.

This is our exhibit and catalog car, and it includes every Standardization benefit for your examination. 50'6" in length, this PS-1 is the criterion car of the industry. In it are cut-aways, models and displays that detail its standardized construction. Whether you are a railroad executive or a shipper, you will be interested in the many aspects of this new car that bring direct benefits to you. While examining this new PS-1, be sure to inspect the many specialties and accessories available to you.



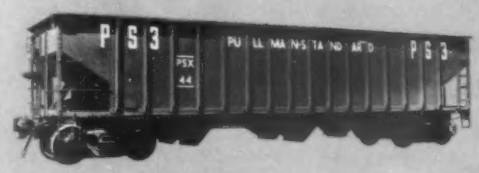
3—PS-2 COVERED HOPPER CAR.

This standardized weather-excluding car is Pullman-Standard's contribution to the growing preference for shipping dry granular materials in economical bulk form. This unit comes in two sizes, 2 hopper, 2003 cu.ft., and 3-hopper, 2893 cu.ft. Note the patented P-S design of circular hatches and hatch coamings, and the exclusive new P-S design of outlet gate. It will be worth your while to look into this car to inspect the smooth, fast unloading, self-cleaning, welded interior.



4—PS-3 HOPPER CAR.

This member of the P-S Standardized line is truly designed to be a work-horse. Built with unusual strength to withstand the hard service traditionally given hoppers, the PS-3 includes many features of interest to you. For example, it too, is self-cleaning because of its smooth interior. And its structural components are designed to work together for mutual support and long in-service life. The car displayed has been subjected to a year of laboratory testing as well as a year of on-line rugged duty including car dumper and shaker service.



5—PS-4 ALL-PURPOSE FLAT CAR.

The newest member of the Pullman-Standard line s the standardized all-purpose PS-4 Flat Car. Here's a unit that includes all the strength this ype of car must have, plus a profusion of band-ng-iron locations and stake pockets. Make spe-ial note of the preservative-treated decking, ecurely anchored to give long life and maximum hipper service. This unit can be equipped with ulkheads for special service, or it can include old-down devices for trailers-on-flat car use.

6—P-S BOX CAR COMPARTMENTIZER.

While you are examining the PS-1 sample car, be sure to inspect the most advanced and positive lading protection device available today . . . the P-S Compartmentizer. This easily operated unit is self-contained, and has no loose parts, bars or other equipment that can become lost. Operated by one man, it provides up to 100% elimination of dunnage. But most important, its outstanding performance as a lading protection device is positive proof that the P-S Compartmentizer is a major lading protection tool that benefits both railroad and shipper.

7—P-S CUSHION UNDERFRAME.

And while you are in the sample PS-1, be sure to view the display detailing another important lading protection device . . . the P-S Cushion Underframe. Replacing the conventional underframe beneath a box car, the Cushion Underframe protects both car and lading from train make-up and in-service shocks. Including a sliding sill and a cushion gear, this unit takes over when conventional draft gears reach their capacity and go solid. The P-S Cushion Underframe lengthens the time of the impact, lets the car and lading roll with the punch, and forces damage-causing impacts to drain off harmlessly.

8—P-S PARTS FOR REBUILDING AND REPAIR

Throughout the P-S Caravan you will see Standardized Parts which are available for freight car rebuilding and repair. These parts are the separate components, which, when integrated, create famous P-S Standardized Freight Cars. They bring buyers the same tested and proved quality and strength for which P-S cars are noted. And their standardized uniform construction makes installation easy.

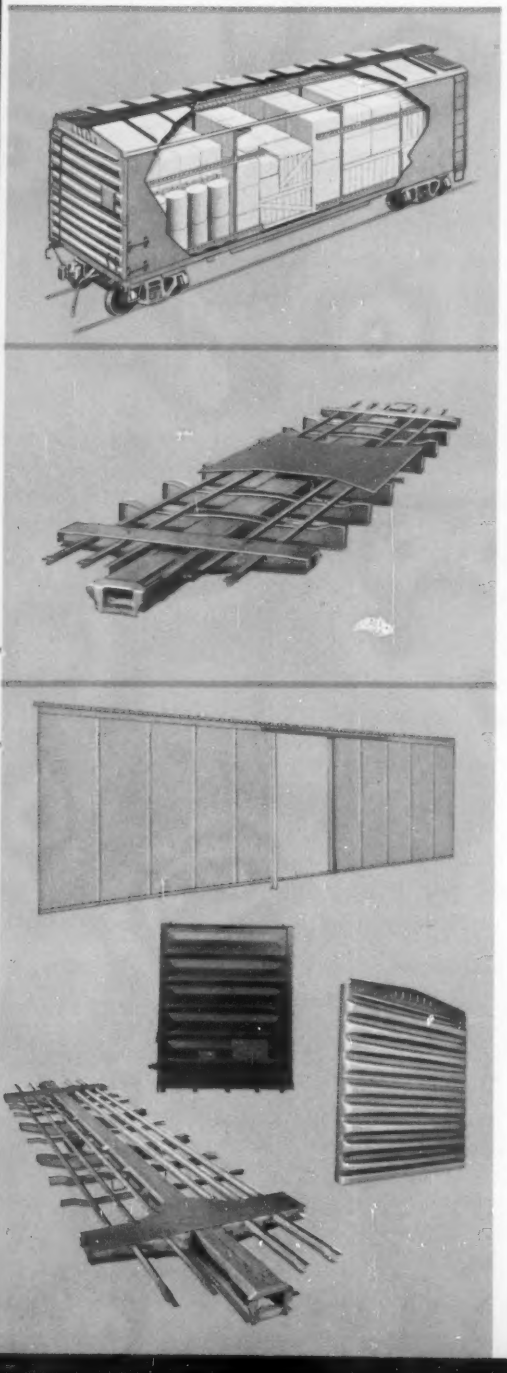
FREIGHT CAR CARAVAN

What the P-S Standardized Freight Car Caravan Means to You

Whether you are a railroad executive, a shipper or a consignee, the P-S Standardized cars on display are significant to you, since their overwhelming acceptance means you will be working with them more and more.

They represent the most advanced design, testing, fabrication and follow-up procedures that the nation's leading carbuilder, Pullman-Standard, can apply to rolling stock. And they are Pullman-Standard's contribution to the railroad industry's continuing efforts to provide constantly improving service for shippers and consignees, insuring, thereby, retention of American transportation leadership.

These standardized cars are more than just the end products of Pullman-Standard's 88 years in the carbuilding business. They are the result of years of experience shared between railroad, shipper, consignee and carbuilder. This means that the needs of the owners and users have received every consideration. And these needs, reflected in the highly diversified conditions experienced throughout interchange, have been designed for, tested for, built for, and then service proved.



All P-S Standardized Freight Cars are built with the multiple economies and low first costs available through long runs of alike cars on modern mass production lines. Costly dies, jigs and fixtures, impossible for limited production custom cars, let Pullman-Standard craftsmen ply their skills with maximum precision and efficiency.

Then, after entering service, all lots of P-S Standardized Freight Cars are followed into the field by trained Service and Sales Engineers. These experts critically inspect P-S cars in service and submit factual performance reports for review by Engineering, Research and Development specialists. Strong points as well as shortcomings are noted for consideration in future lots of P-S Standardized Freight Cars. This is one way in which the cars in the Pullman-Standard line of Standardized Rolling Stock are kept in pace with rapidly accelerating railroad and shipper requirements.

Please feel free to ask Pullman-Standard Caravan attendants for answers to any questions you may have. Or, a note to any of our offices will bring complete literature, and a personal discussion, if you wish.

Write for Free Guest Passes. Guest passes, admitting visitors to the P-S Caravan, are available. Just write and indicate the number you require, to Caravan, Pullman-Standard Car Manufacturing Company, Room 1806, 221 North La Salle Street, Chicago 1, Illinois.

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FREIGHT CAR CARAVAN

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City	Dates	Location
St. Louis	July 16-17	Track 2, St. Louis Union Terminal
St. Paul	July 20	Track 8, St. Paul Union Depot
Minneapolis	July 23-24	Track 1, Great Northern Railway Passenger Terminal
Chicago	July 30-31-Aug. 1-2-3	Track 10, B & O Grand Central Station
Cleveland	August 9-10	Track 5, East 9th Street Coach Yards, Nickel Plate R. R.
Washington, D.C.	Aug. 15-16-17	Track 1, Union Station
Philadelphia	Aug. 22-23-24	Track 1, Pennsylvania Railroad 30th Street Station
New York City	Sept. 11-12-13	New York Central Railroad, Track 2, 10th Avenue Yards at 31st Street

Hours: Daily 9 a.m. to 5 p.m

For Guest Passes admitting visitors to the P-S Caravan, write Caravan, Pullman-Standard Car Manufacturing Company, Room 1806, 221 North La Salle Street, Chicago 1, Ill. Please indicate the number you will require.

Built to serve best on the Great American Railway System

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- Won't water wash
- Not affected by brine dripping
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STANDARD OIL COMPANY
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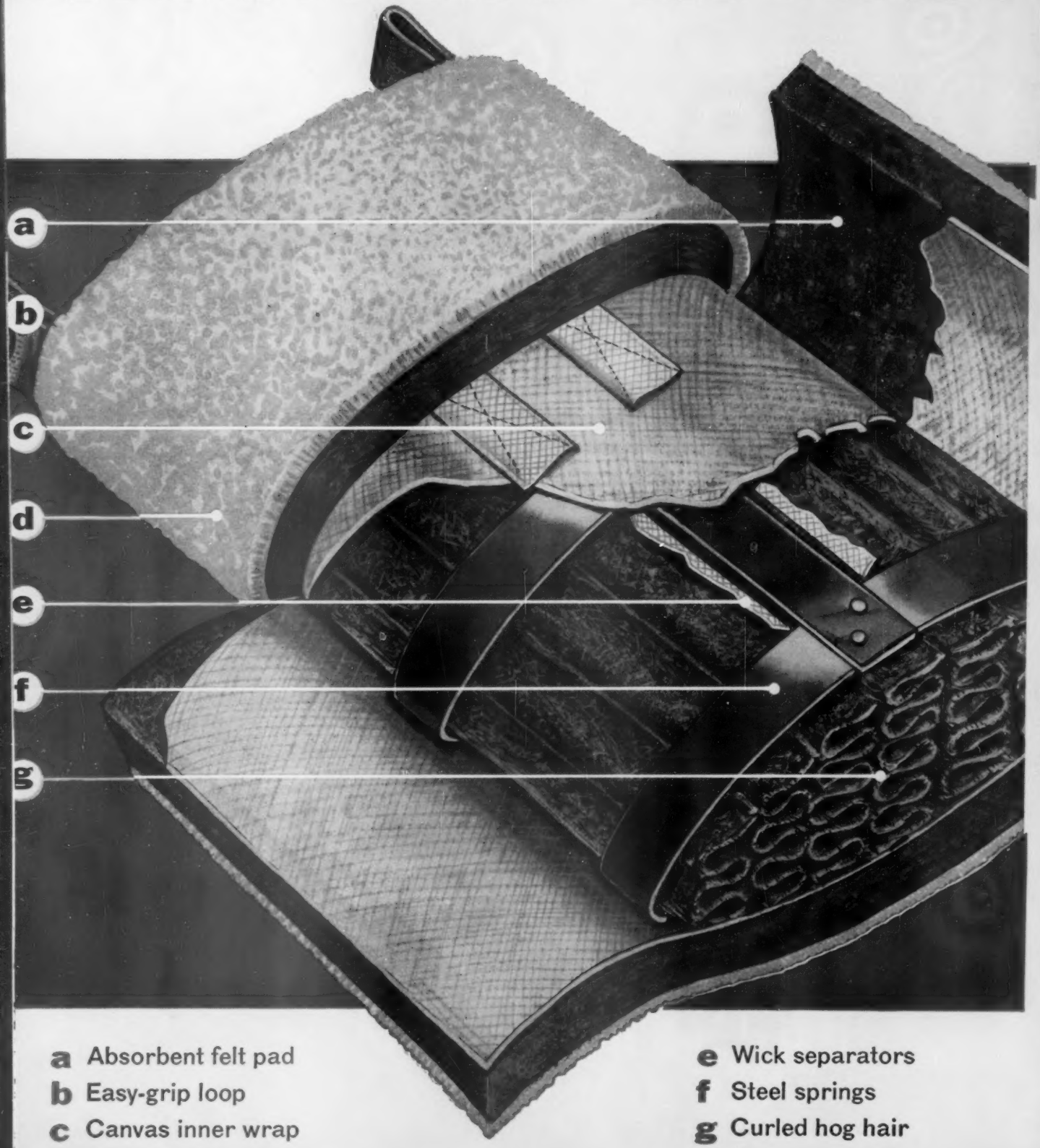
See for yourself

EVERYTHING* IN THIS



a Absorbent felt pad
b Easy-grip loop
c Canvas inner wrap
d Wicking-action cover
e Wick separators
f Steel springs
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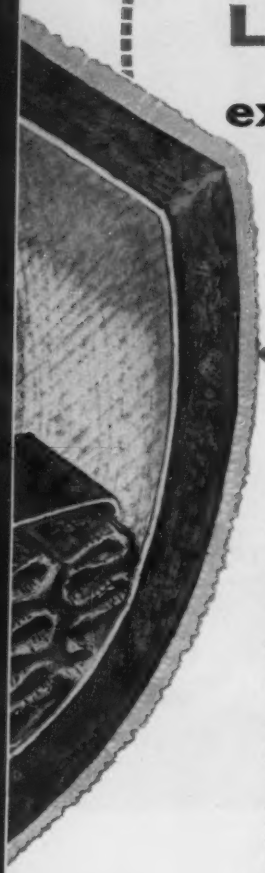
PAD FEEDS OIL...

new spring-action

SPRING-PAK LUBRICATION PAD

PATENTS PENDING

exerts constant pressure on the journal



**Everything except the spring steel, and even that helps!*

Yes . . . in this new Spring-Pak Lubrication Pad, the resilient, curled hog hair acts as a reservoir. . . . The long-lasting cotton pad—the high-quality felt—the wick separators *. . . all have remarkable capillary action . . . all feed oil continuously!*

The tough, cotton outer jacket has been especially selected for its high wicking action—will not glaze—is lint-free.

Flexible, loop handles make application or removal fast and easy. No special skill is required—there's *never* a need to "jack" the box.

Note the inner steel construction in the cut-away illustration. Regardless of temperature, these bands prohibit any possibility of the core collapsing. Made of highly resilient, spring steel, they assure constant pressure on the journal at all times.

Use it . . . re-use it. The new Spring-Pak Lubrication Pad can be easily cleaned in hot oil—has exceptional reclamation value.

SPRING PACKING CORPORATION has been in the journal box lubrication field since 1920. Our trained personnel are thoroughly experienced, always ready to be of service.

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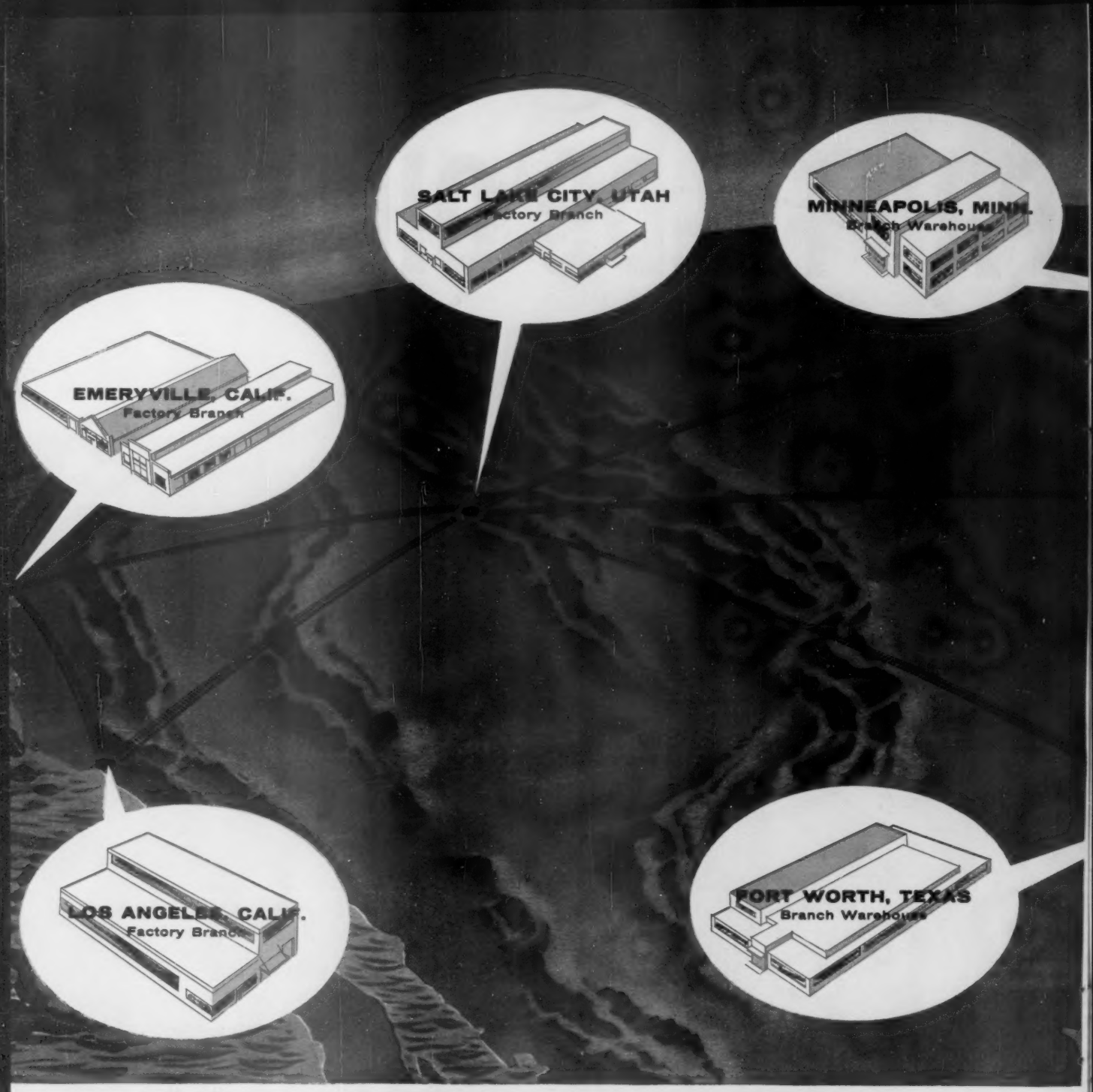

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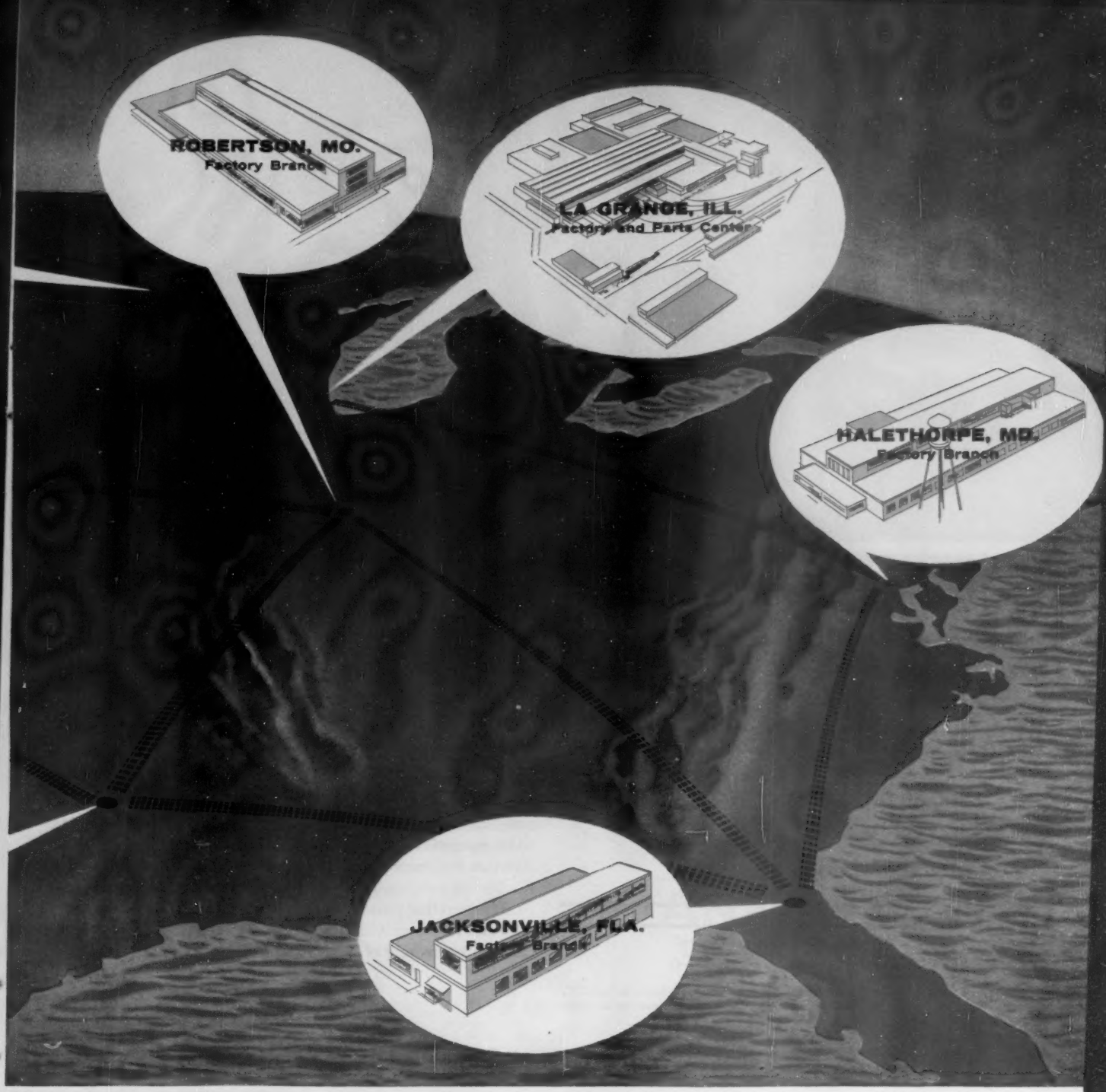
ELECTRO-MOTIVE'S strategic network of Factory Branches and Warehouses puts genuine General Motors locomotive parts within 24 hours of any point in the United States.

It provides "on-line" service for 96% of all General Motors locomotives in this country.

Six factory branches, plus our facilities at La Grange, handle *remanufacture* of major components with the same production-line efficiencies, the same laborsaving tools and equipment used in original manufacture.

Traction motors and other major components are available for immediate shipment on "Unit Exchange." You don't need to hold a locomotive out of service waiting for an assembly to be rebuilt. You can get factory-rebuilt motors overnight—and pay no premium for this service.

Latest improvements in design and manufacture are



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automatically incorporated—and you get the same warranty on "Unit Exchange" as on brand-new assembly.

In addition to saving investment in unneeded facilities, you can operate with smaller inventories—save transportation costs—and keep your locomotives at work more hours per year.

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Home of the Diesel Locomotive

GMDX LOCOMOTIVES

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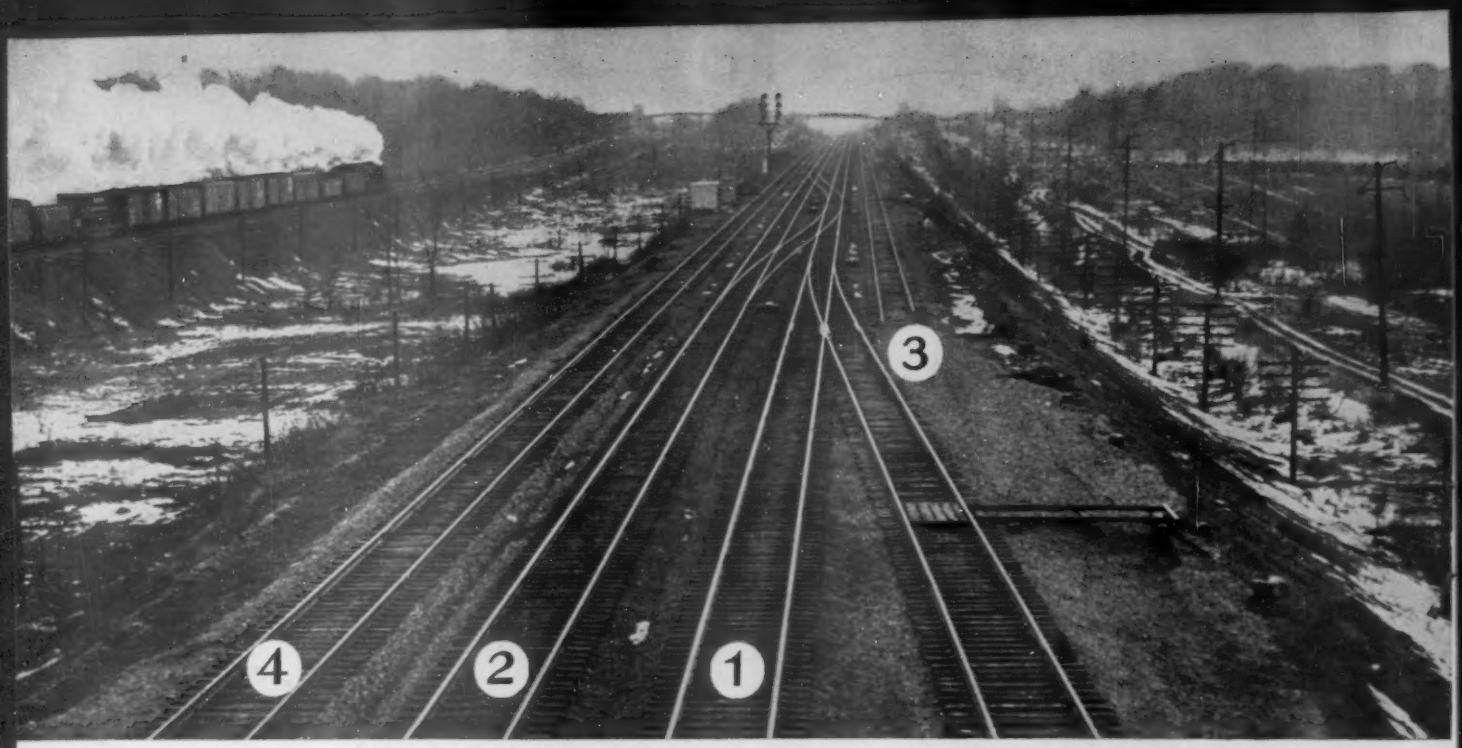


Leaving 4 track territory and entering CTC setup. Track 3 at upper right is out of service and will be taken up. Track 4 will be used in this area as a "work siding."

2 tracks do the work of 4—

CTC is installed on 163 miles of main track —Anaconda power and control cables used

Two of the four single-direction tracks on New York Central's main line between Buffalo and Cleveland are being taken up and CTC installed on the remaining two tracks for either-direction operations. When completed, this will be the largest CTC system in 2-track congested territory in the world.

The pictures on these pages are among the first published on this interesting project. Tracks 3 and 4 will be removed, except for short sections which are to remain in service as work sidings. The same number of trains (about 85 daily) will be handled by

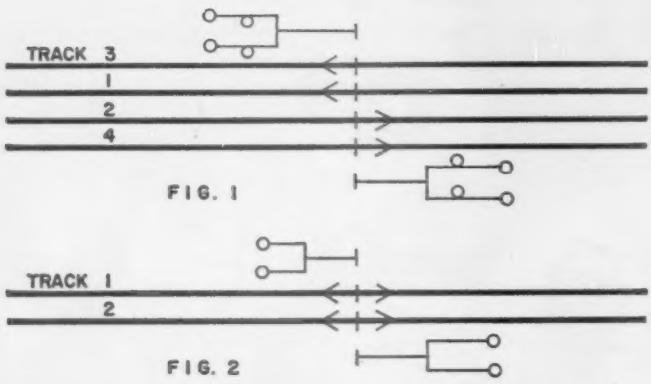


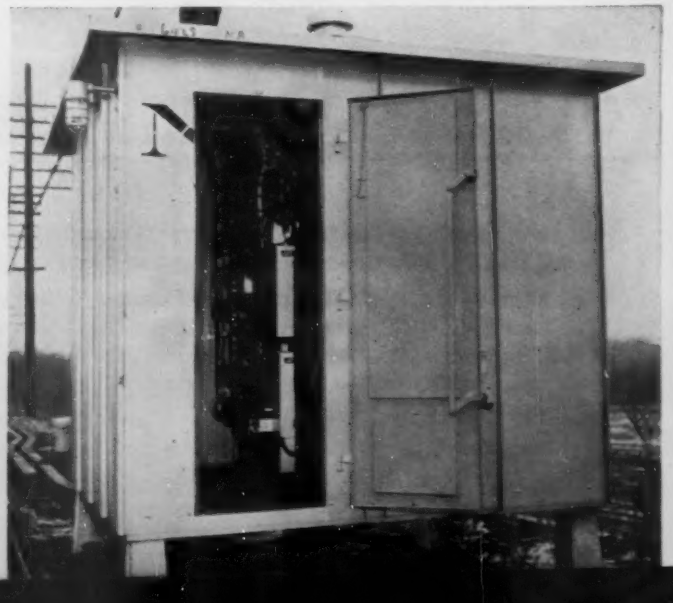
FIG. 1

FIG. 2

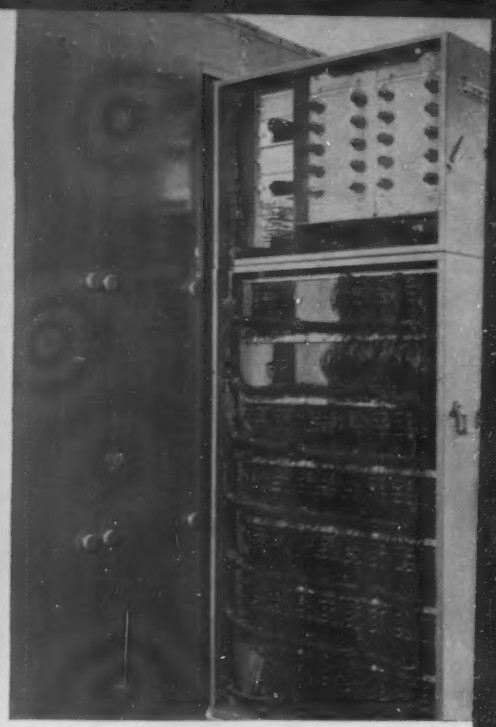
Top. Signaling for single-direction operation on each of four main tracks before CTC. **Bottom.** Signaling for either-direction movements on each of two main tracks after CTC.

Field bungalow that replaces tower in background is main control point over a large area. It controls switches and signals in its immediate area. Aerial cable connects bungalow with line wire on poles.

Interior of bungalow reveals neat, compact system of control wires and cables. Underground cable runs to field signal cases in area.



One of two CTC machines located at Erie, Pa., that will control traffic from BV Tower near Buffalo to BR Tower at Nottingham, Ohio, about 180 miles.



Rear of control machine containing gating unit and storage and relay units. Cables entering from floor bring power from utility lines.

with CTC on the New York Central

more intensive use of the two tracks remaining. The $6 million CTC system will pay for itself through reductions in maintenance and operating expense.

Nerves of CTC are copper

It is, of course, hardly surprising that much of the cable used on this CTC system was made by Anaconda. For Anaconda Wire & Cable Company has been supplying major railroads with wire and cable for every important use for more than a quarter of a century.

Whatever your cable need, whatever your cable problem, Anaconda offers a rare combination of skills required to make dependable cable—metallurgical, design, manufacturing and application engineering—plus quick service from over 400 distributors backed by seven fabricating plants strategically located across the country.

The *Man from Anaconda* will be glad to serve your needs, too. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

See the Man from

ANACONDA®

for Railroad Cable

Underground cable connects local field signal case with switch mechanism on track.

Signal masts are connected to field bungalows or field signal cases by underground cable.

Six-track signal bridge at Dunkirk, N. Y., being dismantled after signalmen have activated new CTC signal mast.

GRATE-X*

EXPANDED METAL GRATING

for safety underfoot . . . strong, lightweight . . . easy to fabricate

This "see-through" grating by U. S. G. is ideal for fabrication of flooring, walkways, platforms, stair treads and for other uses underfoot, such as pit flooring in diesel repair shops, where solid surfaces are not desired. Slit and cold-drawn from a solid sheet of metal, GRATE-X offers many advantages. Formed like a truss, its load-bearing strength is high. At the same time, its light weight contributes to low cost. You can bolt, weld, cut and fabricate stock sheets of GRATE-X without difficulty. Its high-traction surface means it's extra safe! And virtually no maintenance is necessary, because GRATE-X is "self-cleaning." For your other open mesh requirements, such as guards and enclosures, lighter-gauge EXPAND-X* expanded metals are ideal.

For informative catalogs on GRATE-X or EXPAND-X, write today to Dept. RA-1, 300 West Adams Street, Chicago 6, Illinois

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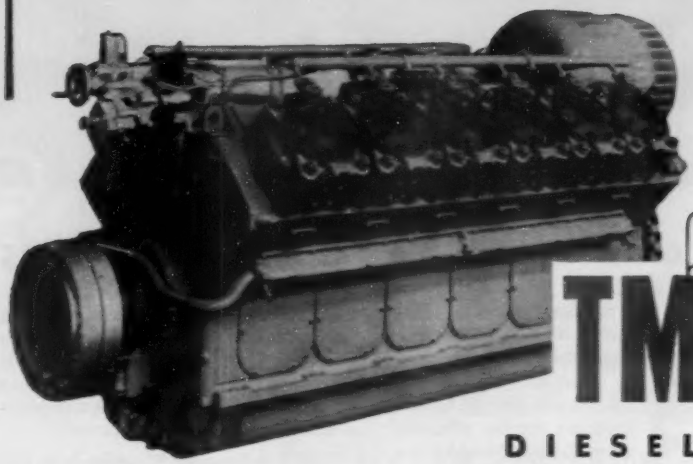

TM 625

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powered by slow-speed 2-stroke DEUTZ diesel engines and equipped with hydraulic transmissions, for shunting and line service, with 4 to 12 cylinders, output ranging from 240 to 2000 HP

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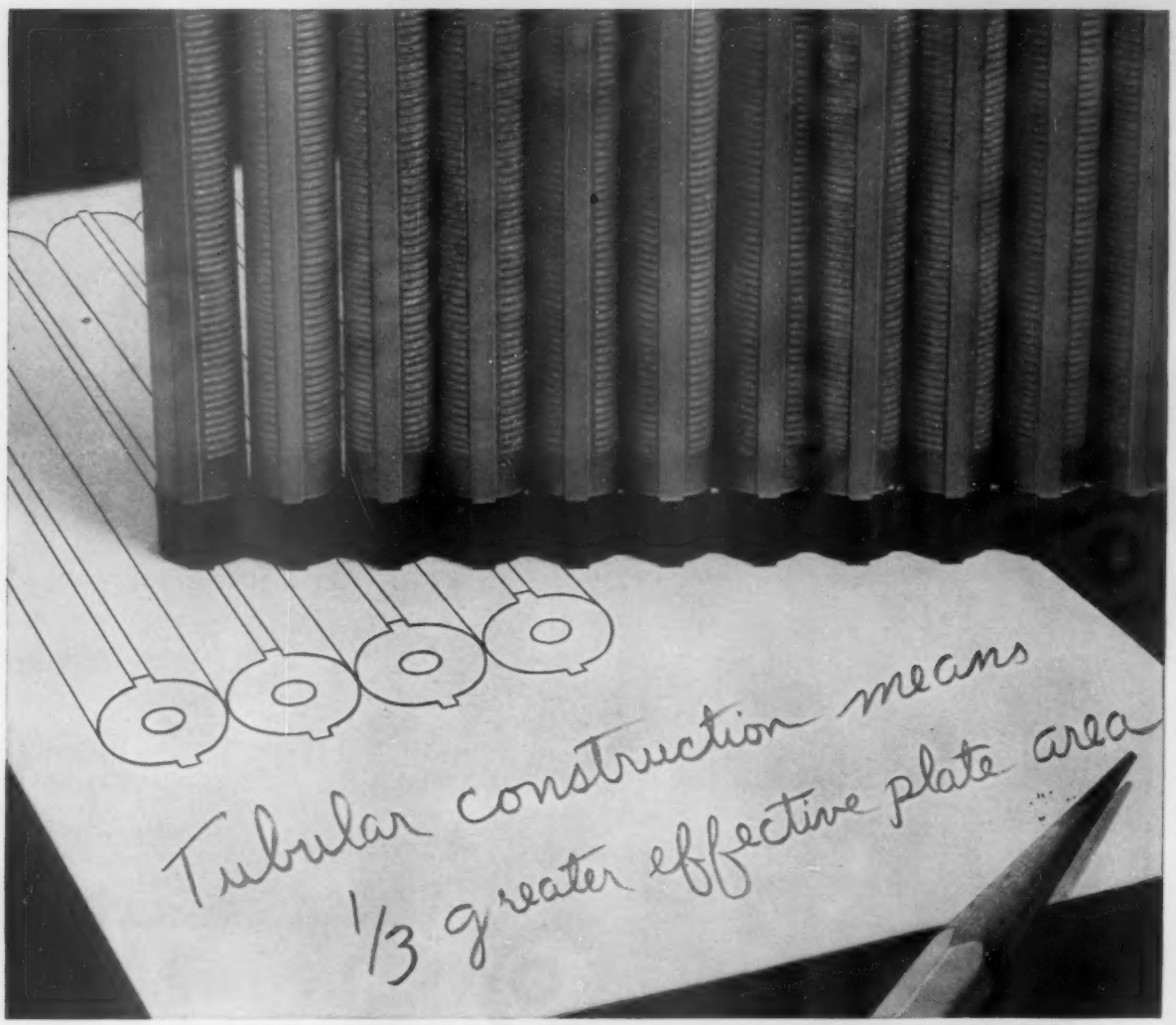
EXIDE-IRONCLAD BATTERIES



Greater effective plate area boosts power for peak loads

BATTERY FOR RAILWAY DIESEL STARTING. Model MV-D. Its tubular construction provides for extra reservoirs of electrolyte adjacent to positive plate. Battery better able to supply sudden heavy power drafts to turn over starting motors. Extra heavy connectors offer minimum resistance to heavy currents. Write for Bulletin 5348.

According to general principles of storage battery engineering, power reserve is governed by positive plate area. In the Exide-Ironclad greater effective plate area is achieved without increasing plate size. Here's how:

In the Exide-Ironclad positive plate, active material is held captive in tubes of slotted polyethylene. These tubes are arranged in a tight row with electrical connections only at the top. The actual surface of the plate is the combined semicircular sides of these tubes—the total surface area being roughly one-third more than the projected dimensions of the plate.

In use, this unique design feature means that more active material is exposed to electrolyte for a given size battery. It means the battery can provide power to spare for peak loads as well as a dependable source of continuous power.

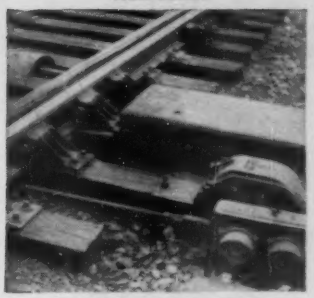
Only Exide-Ironclad Batteries have this advantage. Be sure to specify them when you order—for either new equipment or for replacement. Exide Industrial Division, The Electric Storage Battery Company, Phila. 2, Pa.

Exide®

Rail Joints

Bridges

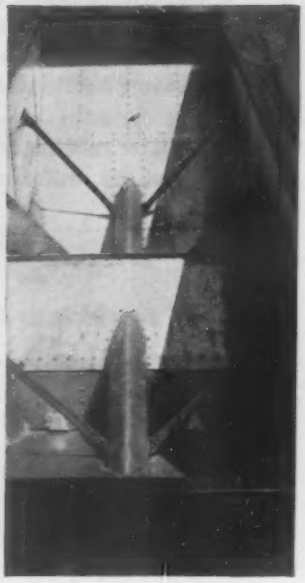
Stored Materials



Signal Equipment

Car Journals

Pipe Protection



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Now—for maximum Roof Protection

Johns-Manville

Aquadam

Built-Up Roofs*

Aquadam offers these important advantages:

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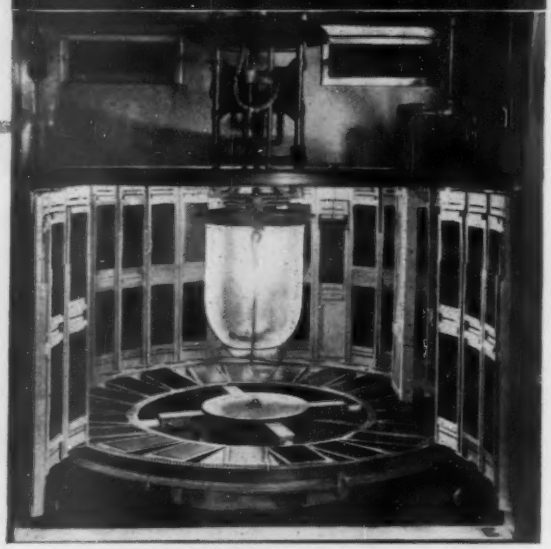
- Excellent uniformity

Tests prove Aquadam's superior weather resistance!



J-M's Accelerated Weathering Test subjected samples of dead level bitumens to repeated radiation, water spray and refrigeration. Results: Aquadam has approximately twice the ability of typical asphalts to retain its initial properties on exposure.

J-M Aquadam proved superior by actual test... helps provide longer roof life at no extra cost

Johns-Manville Aquadam is specifically designed to provide maximum built-up roof service for deck inclines from dead level to ½″ per foot*.

J-M Aquadam Built-Up Roofs owe their proven superiority to the newly developed bituminous asphalt cementing agent Aquadam—which is used in the application of the roofing felts.

When applied, the excellent adhesive properties of Aquadam provide a permanent bond to the felts, and to gravel or slag surfacing. Its rigidly controlled quality and excellent flow properties assure easier mopping, thorough coverage, and longer lasting roof life.

For complete information about Aquadam Roofs, see your Approved Johns-Manville Built-Up Roofing Contractor. He's listed in the classified section of the telephone directory. Or write Johns-Manville, Box 158, New York 16, N. Y. In Canada, write 565 Lakeshore Rd. East, Port Credit, Ont.

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Certified A.A.R.

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Fits standard 24⅝-inch pockets! Uses two standard 2¼-inch followers per gear. Without draft rigging changes of any kind, Cardwell R-20 Rubber Draft Gears are completely interchangeable.

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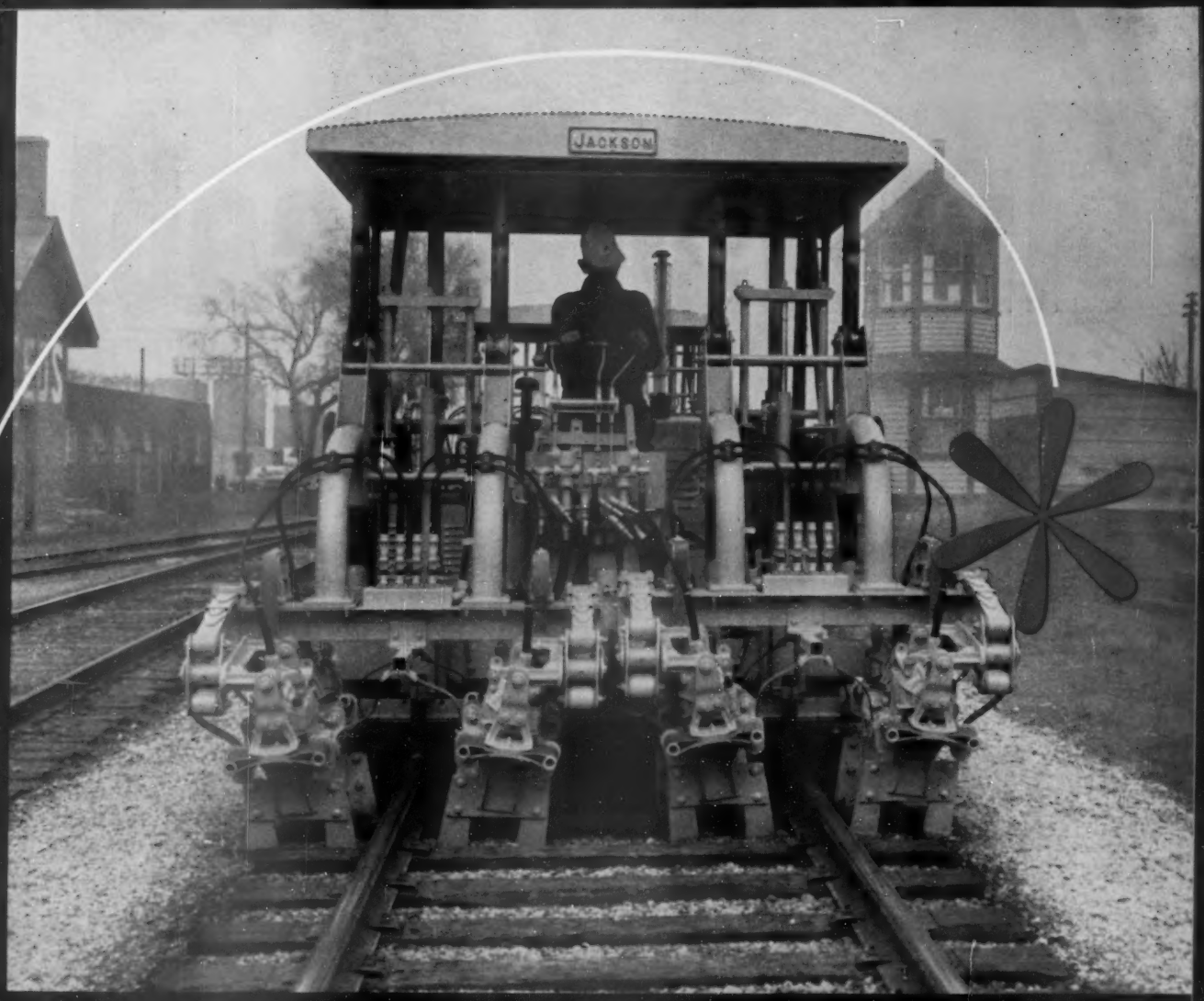

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The evidence of this machine's great superiority as a means of both putting up and maintaining track of finest quality — in any ballast, under ALL conditions — is so preponderant that we confidently predict neither you nor any track chief who possesses the complete facts will specify any other. By all means write, wire or phone for complete information before making any commitments.

Acquirement plans to suit your needs.

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The Highway Bill—A Victory or a Defeat?

Some people seem to believe that the railroads took another shellacking in the enactment by Congress a couple of weeks ago of the "big highway bill." This paper does not share that opinion—in the light of all the circumstances. Considering the thorough "conditioning" the American people have received, for a generation, in the acceptance of socialistic practices in the financing of highways, waterways and aviation facilities—the final form that the highway bill took represents gains, rather than losses, for "user pays" principles.

The country needs more and better highways, but there is also no doubt that such highways could have been provided by the toll-road process. If the states had quit building anything but secondary roads with highway tax money and had charged trucks adequately on a ton-mile basis for the use of non-toll roads, the demand for toll-roads would have been tremendous. Such roads would then have been built—and the public could have had its system of interstate highways without paying any increased taxes whatever.

However, that is all water over the dam—at least temporarily. A great ballyhoo was very skilfully developed in both political parties for this highway program—just as there was for the St. Lawrence Seaway. There was no more chance that the relatively few 100 per cent anti-socialists in this country could have stopped this highway program—and diverted it into a strictly self-financing project—than there would be of turning the post office department over to private enterprise.

Doing What's Possible

Under such circumstances, a realistic anti-socialist does not choose to fight a last-ditch battle he cannot win—but wisely selects some areas of the terrain that he believes he stands a good chance of capturing, and proceeds to do so. That is what the anti-socialists did in the case of the highway bill. A year ago a "pay-as-you go" highway bill was defeated—largely (so many observers said) because of opposition on the part of the organized truckers. Congress was in no mood, however, to vote the money for the highways without assessing the cost—or most of it—on highway users, in additional taxes. So when the highway bill was taken up again, in 1956, the legislators again went to work to "find the money" in increased levies on highway users.

In addition to added "across-the-board" taxes levied on motor fuels and rubber, the manufacturers' excise tax on trucks and buses was increased from 8 to 10 per cent, making the rate the same as that for automobiles. In spite of strenuous opposition by the trucking industry a special annual tax of $1.50 per 1,000 lb. of gross vehicle weight was levied directly on all vehicles weighing over 26,000 lb. These user taxes, while an inadequate measure of the trucks' share of highway costs, do recognize at the federal level a fact that most states have understood and acted upon for years, viz., that "across-the-board" taxes really levy upon the private motorist a large part of the highway costs which are attributable to trucks.

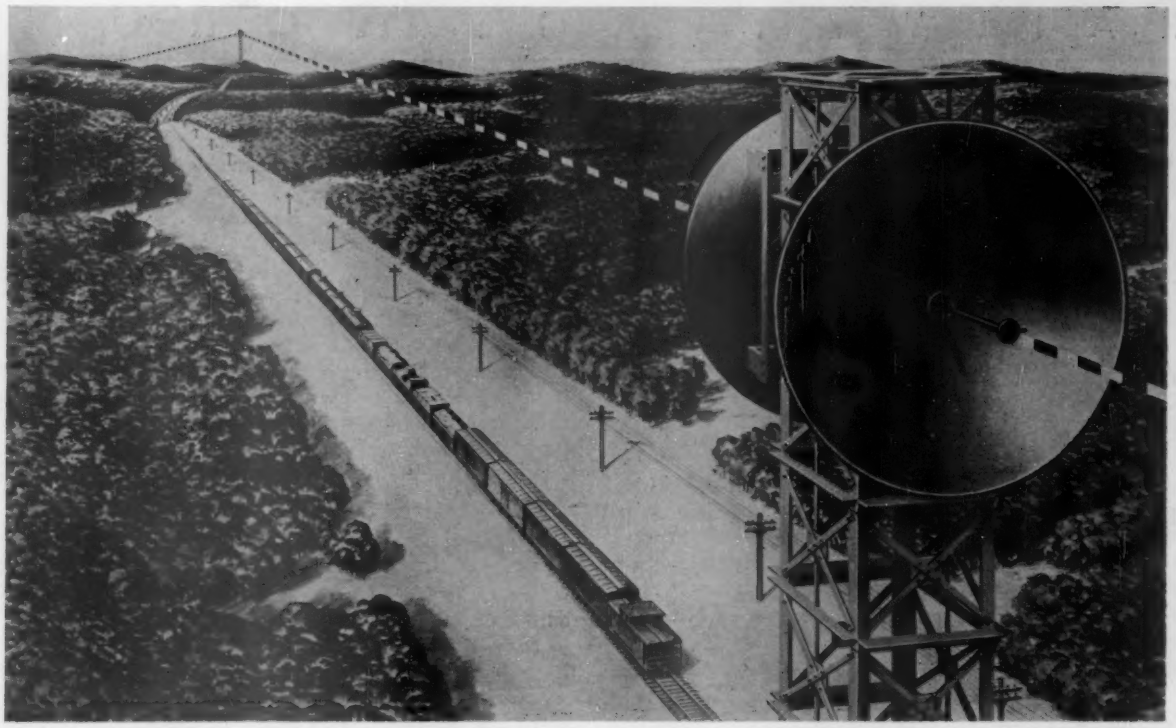
Limit on Size

Also recognized in the new legislation was the need to curb the permissible size and weight of vehicles so as to conserve existing roads and protect the new ones to be built. The law provides that no federal funds be granted any state permitting vehicles to use its interstate highways with weights in excess of the greater of the existing state limits, or the federal limits of 18,000 lb. on a single axle, 32,000 lb. on a tandem axle, a gross weight of 73,280 lb., or a width of 96 in.

Further, Congress directed in the new law that the Department of Commerce make certain studies and report by March 1, 1959—(1) to determine the maximum desirable dimensions and weights of vehicles to be used on federal-aid highways, and (2) to determine, in cooperation with the Interstate Commerce Commission and others, the proportionate share of highway costs attributable to each class of users.

Some of the best informed students of highway finance in the United States are employed by the railroads—at the AAR and by other railroad associations. There is hardly any pertinent information on this vast and important question that cannot be readily obtained upon inquiry from specialists in railroad employ—and this is not a new activity, but one consistently followed for more than two decades. The knowledge of these able analysts was certainly made available to the legislators in the drafting of this highway legislation. Without the benefit of information of this kind, it seems highly doubtful whether all or any of the constructive features of the new legislation would have been included.

Eventually, most economic problems receive an economic solution—the length of the "time lag" depending on the intensity of economic study which is devoted to them. The railroads by assigning competent people to the study of highway finance have made an important contribution toward shortening the "time lag" in attaining more adequate understanding of sound principles in this domain. They should continue and intensify such studies, in their own interest as well as in that of the public welfare.



MICROWAVE BEAM travels on line-of-sight from one repeater station to the next.

How Electrons Move the Railroads

Their application today saves time and trims costs—Prospect for tomorrow is that even bigger things are coming

By JOHN H. DUNN
Signal & Communications Editor

From hot box detection to car classification and from CTC to passenger space reservation, the growing use of electronics is one of the biggest stories in railroading today. But what has been done and what is now going on may be overshadowed by what the future can bring.

The Rock Island is now making the first permanent installation of an electronic wayside device for detecting hot journal boxes on passing freight trains at speeds up to 60 mph. This installation was the result of field tests and developments of more than a year on the railroad.

These detectors, installed extensively, could be used to assemble data that would assist the railroad in developing a "pattern" of hot box occurrences, with respect to: (1) type of cars; (2) lading; (3) lubricants; (4) seasons of the year; (5) time of day; and (6) distance traveled from the last yard.

By means of electronic devices, trains can automatically identify themselves as they approach or pass unattended offices or junctions. In such a system, the rear car of each train carries an inert coil, tuned to a frequency in the 160 kc to 310 kc range. At each wayside office, a coil is mounted at a location within the field (about 6 in.) of the coils on the rear cars of trains as they pass by. While a rear car is approaching and passing, the fixed wayside coil is energized by a sweep frequency which detects that of the passing coil. This identification is amplified by electronic devices, and is transmitted as an "OS" report to the nearest open office or to the dispatcher.

Electronic equipment was used in 1953 by the Chicago Transit Authority, so approaching trains could automatically control the power switch machines and interlocking signals at unattended junction interlockings, thereby obviating the need for levermen.

Electronic track scales have been put in operation in nearly a dozen new gravity classification yards, and more are being installed. Advantages of this type of track scales are: (1) more simple construction; (2) motion weighing in 3 sec at an average speed of 6 to 8 mph, which is as fast as cars can be handled through retarders and switches of the mod-

ern yard; (3) automatic printing of weight on cards or tape; and (4) automatic punching of data processing cards or tape.

Electronics, including radar, has, within the last five years, brought about complete automatic control to replace manual control of power switch machines and car retarders in gravity classification yards.

Previously, with manual control power switches and retarders, a yard of 40 to 50 classification tracks required three or four control towers, with a man on duty in each tower. With modern automatic switching and automatic retarder controls in such a yard, only one man is required, and his duties are to monitor the operations.

Electronics has a part in present-day, and future, centralized traffic control. Early projects known as remote control, required many wires from the control office to each power switch and signals at that switch. However, for busy territories of more than 35 miles, there could be too much line delay, because only one outgoing control, or incoming indication, could be handled at one time.

"Scanning" Field Locations

By means of a new adaptation of electronic equipment, first made available last year, outgoing control codes now can be separated from incoming indications, all on the same pair of wires, for entire divisions of up to 150 miles or more. In this new system, a separate multiple-channel high-frequency carrier is used constantly to "scan" field locations to bring in indications to the office to repeat the position of switches, aspects of signals, and locations of trains as they move over the territory. Although not television, this adaptation approaches it in some ways, in that the "scanning," of as many as 400 field conditions, is repeated every four seconds.

Recent announcements have been made by two manufacturers about new audio frequency electronic track circuits. At an outlying location, an electronic track circuit can be applied for local control, with no need for insulated rail joints to confine it to certain limits. Also, an electronic circuit can be superimposed on an existing conventional track circuit without interference between the operations of the two circuits. For example, at an electric lock on a hand-throw switch in centralized traffic control territory, an electronic track circuit can be used independently for release of the lock. In such locations, no insulated rail joints are required for isolating the short circuit. Controls are simplified, thus reducing construction costs compared with a separate short track circuit of the conventional type.

FACSIMILE EQUIPMENT will produce, in customer's office, actual tickets for passenger reservations. This is a part of the Pennsylvania's new ticket sales program in the New York area.

Electronics was the missing link that made possible the system now known as continuously controlled cab signaling, with or without automatic train control. On railroads in the United States, cab signaling or automatic train control is now in service on over 14,460 miles of track and on 5,943 locomotives.

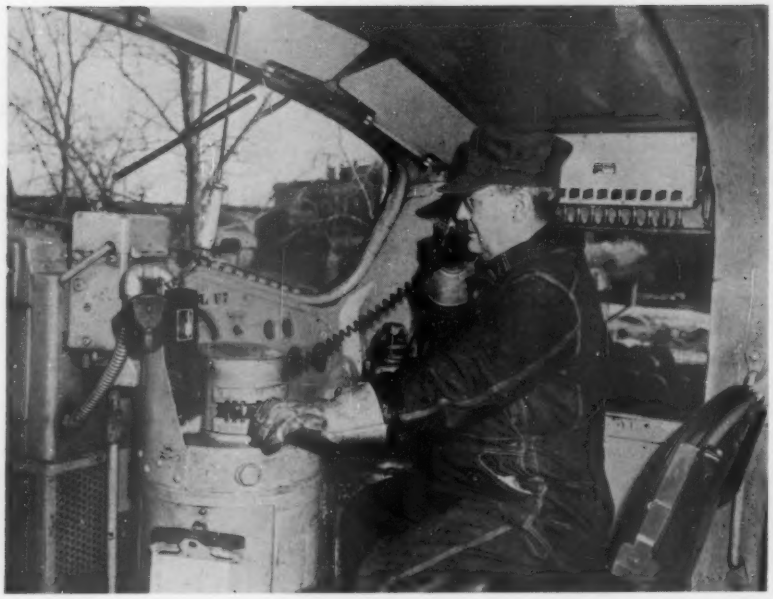
An electronic system has been developed, and is now being installed on three railroads, to expedite handling of reservations for sleeping car and parlor car accommodations. Basically, the system consists of an electronic memory drum for the storage of information on available, reserved and sold accommodations, and a means of reading out this information, and changing it, from many remote ticket-selling locations.

In the system as now planned, agent's "key sets" in 60 cities on the New York Central, the New Haven and the Santa Fe, will be connected to electronic storage drums in New York and Chicago which can store reservations for all trains of the three roads for up to seven months. At the end of each day, the electronic equipment automatically cancels all reservations which have expired without having been picked up, thus making the space again available for sale.

When installing such a system, the transmission of information back and forth between remote offices and the electronic drum will require many additional line wire communications circuits which will be derived by applying carrier and microwave electronic systems.

By means of facsimile apparatus, operating over line circuits between offices, typed or hand written messages, small drawings, tickets and waybills, in one office, can be reproduced in permanent form on paper in a distant office. This facsimile equipment is entirely different from television, but the operations and transmission between offices includes various forms of electronic devices. As part of the new ticket sales operations in Pennsylvania Station in New York, facsimile equipment and circuits will be used to produce, in the offices of customers, actual tickets for carfare and sleeping accommodations.

Railroads have actively adopted electronic brains to accounting processes, purchases and stores operations, movement and assignment of cars, payrolls, pay checks and cost accounting. Daily inventory of empty freight cars by type and location; and perpetual inventory of all materials in stores; and record of miles



ENGINEMAN uses radio to talk with his conductor in caboose, or with operator or dispatcher in their offices.

run by each locomotive every day for inspection scheduling, are examples of some uses for the electronic brains that are expected to save railroads much money.

These electronic machines used by railroads are of the same basic design as those used in all industry. However, railroads have special problems in quick transmission of information from all parts of the railroad to the office with the electronic brain, and again to send out the "answers" to many cities on the railroad. The additional telephone and printing telegraph circuits required are being derived on many railroads by installing electronic carrier apparatus, by means of which numerous circuits can be derived by superimposing several different frequencies on one pair of line wires. Also, additional circuits can be derived by installing microwave.

Electronics, as applied in two-way radio and in inductive systems, has brought important new aids to operations not only on the road but also in yards and terminals. This system of radio, as applied to train operations, will be extended rapidly on many railroads.

Thus, in a thousand-and-one ways, radio on trains, as well as in yards and terminals, is saving time, money and "shoe leather." More than 90 railroads have made such installations covering about 13,000 locomotives and cabooses, and over 800 wayside stations.

Conventional radio is broadcast in all directions from the transmitter station. In contrast, microwave is transmitted in one direction only (like the beam of light from a powerful searchlight). A microwave beam travels along a line-of-sight, therefore in ordinary installations, repeater stations, on towers, are spaced about 25 to 30 miles apart. Installations are now in service to test "over-the-horizon" microwave, in which repeater stations will not be required for a distance from 100 to 200 miles.

Ordinary radio stations broadcast only at one frequency, and, therefore, carry only one message, whereas a microwave beam can "carry" many frequencies simultaneously. The microwave installation on the Santa Fe between Galveston, Tex., and Beaumont, is handling eight voice channels with six channels of telegraph, and can be expanded to carry 18 more telegraph channels. The Rock Island has an installation of microwave on 106 miles in Kansas. The Southern Pacific is now constructing microwave in mountainous country in northern California to handle not only centralized traffic control circuits, but also communications circuits, the capacity of this system being 120 channels.

The New Haven has made surveys for a proposed microwave system between New York and Boston to replace existing pole line in territories where hurricanes have brought extensive damage in recent years. The FCC has authorized installation of microwave on three subsidiaries of the Southern Railway System in the general vicinity of Adel, Ga. and Perry, Fla.

Railroads have not installed more microwave because of lack of cooperation on the part of Bell Telephone operating companies to permit railroads to connect microwave systems to the telephones in railroad offices on the same basis that the phones are now being connected through private exchange switchboards, operated by railroad employees, to circuits on line wires owned by railroads. This issue is expected to be resolved promptly. An important reason for immediate action is that the railroads should utilize the microwave channels available to them, otherwise the FCC may assign these channels to other services.

Most Extensive TV

Probably the most extensive television installation conceived by any railroad is now being completed by the Pennsylvania, in Pennsylvania Station, New York, where 100 TV cameras and 96 receivers are to be used for transmitting information about space availability, as well as actual space assignments. This is the first audio-video installation in which the customer is a principal participant, along with the ticket seller and space distributor.

Electronics, in the form of carrier equipment, has made possible the use of one pair of line wires to carry many different frequency channels and thus handle many telephone conversations and telegraph messages simultaneously. Some carrier equipment now on the market has a capacity of up to 12 channels. This means one pair of line wires could simultaneously handle 12 telephone conversations or 216 printing telegraph messages.

Since this "wired radio" carrier was placed on the market, the trend when rebuilding pole lines on railroads has been to reduce the number of line wires. In some instances,

in territories where storms have previously broken line wires, the tendency is to install one or two pairs of new larger wires with high tensile strength, to withstand storms and ice loads, and then use carrier to superimpose many circuits on these new wires.

Demand Will Double

During the last three years, railroads have installed a yearly average of 178,000 circuit miles of carrier. Because many more line circuits will be needed in connection with electronic brain accounting machine systems, and for ticket sales, one authority has estimated that demand for carrier apparatus will double in the next two or three years.

The electronic amplifier and the loudspeaker, as developed for use in broadcasted radio, were readily adapted into wire-connected systems for paging in station shops and yards. Before use of these new systems, yardmasters used up much shoe leather, chasing back and forth, two jumps behind trouble. Now they sit in elevated towers where they can see and talk directly to men working throughout large yards. Thus they are informed ahead of time of changing circumstances, and they take action to prevent delays and congestion. Electronic amplifiers, as included in modern yard talk-back loudspeaker communication systems, have expedited yard operations so effectively that an average of about 45 yards, including 400 or more loudspeakers, are being so equipped each year.

Electronic amplifiers, in connection with loudspeakers and control panels are being used in centralized checking systems in lcl freighthouses. Up to 1950, most roads assigned a full time checker for each crew of two men that was unloading a car. In the new system, using portable talk-back loudspeakers in the cars, connected to control consoles in the office, each checker, working in the office, can do the checking effectively for three or four unloading crews. These systems also include paging and talk-back loudspeakers throughout the freighthouses for quick-call and answer-back communication between the office and the foreman, or other men anywhere in the house or on the platforms. Because of the increased efficiency and improved service to the public, electronic centralized checking systems are being installed in 30 to 40 freighthouses each year.

Railroading

After Hours

by James G. Lyne

Editor, Railway Age

Station Garden

A rural station that I use a lot the year round—and especially in summer—is Kent, Conn., on the New Haven.

The building is one of those traditional old-style "depots"—some of which are not unattractive, and the one at Kent is one of the better-looking ones (so much so that "Life" magazine portrayed it in color a couple of years ago).

The feature of Kent station that gets the big attention this time of the year is the window boxes, overflowing with petunias. The station is painted the traditional red, and the window boxes—which run all around the building—are white.

Topping off the floral display—on the far side of the track from the station is a chestnut rail-fence, painted white, every post of which is adorned with a rose bush (red roses of some continuous blooming variety).

I asked the ticket agent who it was that we had to thank for all these flowers and he said it was the town's Garden Club. There is nothing novel, of course, about a garden club interesting itself in the appearance of the local station. (If memory serves, this practice was going on a good many years ago at another of my favorite country stations—Slater, Mo., on the GM&O, then the Alton).

The only question is—isn't the interest of local gardening enthusiasts in the station's appearance something that, with a little encouragement, could become standard practice in almost every small community — and perhaps in some of the big ones too? It is just as much an advantage to the townspeople, as it is to the railroad, to have the station attractive. Maybe, too, the interest of garden clubs could be aroused in doing some campaigning against the practice of a lot of towns of turning their ugliest aspects toward the railroads—tin cans, ash dumps, and worse.

As John Barriger points out in his book "Super Railroads for a Dynamic American Economy," the diesel has "made the railroad a good neighbor." No longer are smoke and cinders a part of railroading—and there's no real reason why a town shouldn't turn its best face toward the railroad, as it does to a vehicular parkway.

That book of Barriger's is full of constructive ideas for improved railroading—and I'm happy to be able to report that a lot of other people share my enthusiasm for it. One big railroad, for example, has ordered 800 copies and a half-dozen others have taken 200 or more each—besides innumerable orders for smaller quantities.

Promoting Optimism

It isn't just because I'm in the book-selling business that the promise of a wide distribution for this book is heartening to me—but even more because I am as sure that a book of this kind is just what is needed to change pessimists about the railroad business into optimists—with an optimism based not just on fond hope, but on tangible economic and technological fact.

Making Cost Figures Profitable

A lot of data have no practical usefulness, but "incremental costs" are a valuable tool for improving earnings—This study shows how to calculate such costs inexpensively

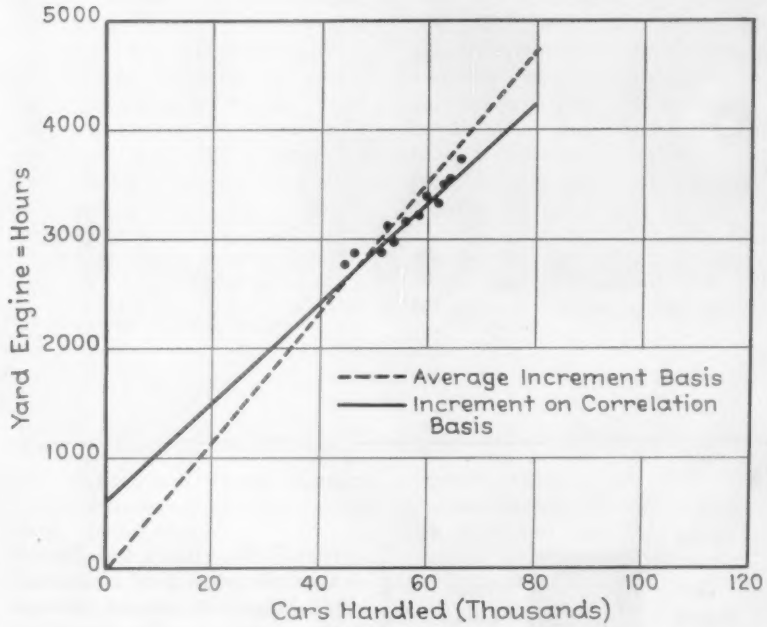


CHART A

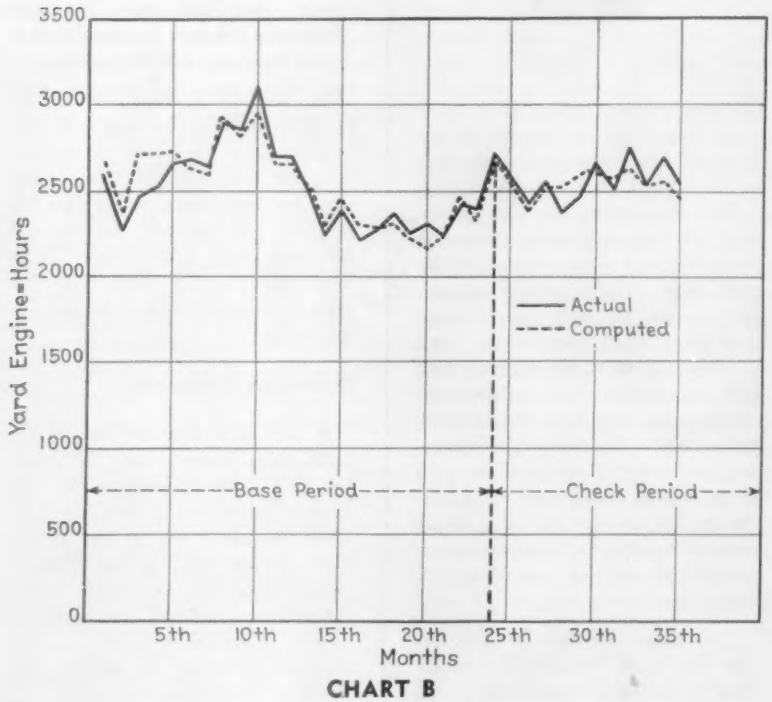


CHART B

By WALTER B. WRIGHT*

Cost-finding is not looked upon by most railroad men as a profitable activity—and for a very good reason. Too many alleged "cost figures" have little real meaning, and are of slight practical use to anybody in doing a better job of railroading.

For example, the ICC has developed railroad costs as regional averages. There is hardly ever a local operation on an individual railroad which would have costs corresponding to a regional average. Hence, this regional average figure will provide no practical or dependable guidance for profitable action by a railroad in dealing with a specific local problem. "Average" cost figures—while perhaps useful to the ICC for some of its purposes—certainly are of limited, if any, usefulness in the solution of specific railroad problems.

Then, again, take the kind of "average costs" the railroads often compute for themselves—such as dividing the total cost of operating a certain yard for a month by the number of cars handled in and out during that month. Such an "average" might have some validity in comparing performance of one year with another—but it would be valueless in reaching a decision as to whether it would pay to put more work into this particular yard or not. For practical decisions on specific problems, information is needed on "incremental costs," e.g., not the average cost of car handling but the

*The author is at present staff assistant on the C&O. He was formerly examiner in the Railroad Division of the Reconstruction Finance Corporation, at which time he became well acquainted with practices in the area of his interest on numerous roads throughout the country—on which experience the theme of this article is based.

added cost of handling additional cars—or the decreased costs from handling fewer cars. Data of this kind can be obtained by detailed time studies, but such studies are expensive. The problem, then, is to get useful cost information—and to do so without prohibitive expense.

Accurate information on costs which will be incurred by added traffic (or which will be saved if traffic declines) is, moreover, of strategic importance to the railroads for making realistic decisions in competitive rate-making.

Ordinary cost calculations usually neglect to separate adequately those costs which increase with traffic from those which do not. It is well known that a certain amount of yard engine-hours are consumed in fueling, running light, waiting for trains or orders—time used which has no relationship, or perhaps an inverse relationship, to the actual work performed. In computing a simple average time per car switched, such unproductive time is included within the average, thus making such averages of questionable value in ascertaining the cost of increased switching under varying traffic loads.

A Simple Situation

Take a simple situation, for example—a reasonably modern classification yard, herein called "North Yard," where all cars receive the same general type of switch. I have computed the number of engine-hours which would have been worked each month on the basis of average time required. Table I shows twelve monthly observations of actual yard engine-hours (Col. 1); the actual cars classified (Col. 2); the calculated hours based on average time (Col. 3); and the amount of difference (or variance) from actual (Col. 4).

By dividing the sum of the yard engine-hours required (Col. 1) by the sum of the actual cars handled (Col. 2) we find that the average time required per switch amounted to .05778 yard engine-hours. A check as to the accuracy of this average in computing the yard engine hours per month can be made by multiplying the actual cars handled by this .05778 average engine-hours per switch, producing the calculated yard engine-hours shown in column 3.

TABLE I—ACTUAL AND COMPUTED ENGINE-HOURS PER CAR

Month	Actual Yard Engine Hours	Actual Cars Handled	Calculated Eng. Hrs. at Avg. time of .05778 per car	Amount Calculated is over (+) or under (—) Actual
1	3,771	65,026	3,756	— 15
2	3,524	62,458	3,609	+ 85
3	3,552	63,393	3,663	+111
4	3,362	60,808	3,513	+151
5	3,431	59,824	3,457	+ 26
6	2,896	50,380	2,911	+ 15
7	3,236	57,595	3,327	+ 91
8	3,097	50,718	2,930	—167
9	3,120	54,218	3,133	+ 13
10	2,784	45,823	2,648	—136
11	2,895	47,036	2,718	—177
12	2,982	51,662	2,985	+ 3
Totals	38,650	668,941	38,650	0

Average Time per car .05778

Before we accept such a simple average as a reliable measure in determining the cost of handling an additional car at this yard, it would be well to test the data further by determining *to what extent yard engine-hours do not vary with traffic;* and to find out what increment in yard engine-hours occurs because of additional cars handled. This can be done by what is known as correlation analysis (method of least squares). Any good book on statistical methods will explain how to go about such calculations. There is nothing especially difficult about the method — anyone used to working with figures can easily learn it.

Correlation analysis is, simply stated, a measure of the extent to which changes in one or more items (called independent variables) are related to, or cause changes in, another item (called the dependent variable). In solving a correlation problem by the method of least squares, coefficients, or values, are determined for each independent variable, which, when multiplied by that independent variable, will produce on the average a more accurate calculation of the dependent variable than any other method known to mathematics.

Through applying correlation analysis to the data shown in Columns 1 and 2 in Table I it is determined that, within the range of traffic being handled, 687.22 yard engine-hours each month are incurred regardless of traffic volume (i.e., these yard engine-hours are constant); and that .04545 yard engine-hours will be incurred for each car handled. The values so determined provide the basis for Table II. (Page 42.)

In Table II Columns 1 and 2 are identical with the corresponding columns of Table I; Column 3 is obtained through use of the above mentioned values determined by the method of "least squares"; and Column 4 shows the amounts by which the calculated values are over or under actual. Note that in Table I the range of error varies between —177 and +151, a range of 328; whereas the range of error in Table II is between —128 and +89, a range of 217, or only 66 per cent as great. Note that on the plus side, Table I exceeded the maximum error in Table II three times, and on the minus side three times. Thus we observe that a more reliable figure has been obtained through use of the correlation method than was obtained through use of simple averages.

Scatter Diagrams

The fact that the correlation analysis gives a more accurate basis for calculation can also be shown graphically. The data of Tables I and II in the form of a scatter diagram are shown in Chart A. Here the dots represent the actual yard engine-hours required to handle various numbers of cars; and the broken line represents the increase in yard engine-hours that would be called for if the simple average number of cars

TABLE II—ACTUAL YARD ENGINE-HOURS VS. CALCULATED

(Based on 687.22 Constant Hours Plus .04545 Hours per Car Handled)

Month	Actual Yard Eng. Hours	Actual Cars Handled	Calculated Eng. Hours	Amount Calculated Is Over (+) or Under (—) Actual
1	3,771	65,026	2,643	—128
2	3,524	62,458	3,526	+ 2
3	3,552	63,393	3,568	+ 16
4	3,362	60,808	3,451	+ 89
5	3,431	59,824	3,406	— 25
6	2,896	50,380	2,977	+ 81
7	3,236	57,595	3,305	+ 69
8	3,097	50,718	2,992	—105
9	3,120	54,218	3,151	+ 31
10	2,784	45,823	2,770	— 14
11	2,895	47,036	2,825	— 70
12	2,982	51,662	3,036	+ 54
Totals	38,650	668,941	38,650	0

switched per engine-hour is used in the calculation. Note that this broken line shows that, at lower than the average number of cars handled, the number of yard engine-hours indicated is generally less than actual, whereas, when a larger than average number of cars is handled, the simple average overstates the required number of yard engine-hours.

This inaccuracy arises because the simple average neglects to consider those yard engine-hours which do not vary with traffic, and results in *an overstatement of the cost of handling additional traffic*—a dangerous error when attempting to determine the cost of handling traffic which may be recovered from competitive forms of transportation. (In the illustration above the simple average cost per car handled is over 25 per cent larger than the "incremental cost.")

The solid line represents what is known mathematically as the "Line of Best Fit," as determined by correlation analysis. Note that this solid line more closely bisects the scatter of the dots at all volumes of traffic handled, indicating that it much more closely describes the increment in yard engine-hours actually incurred by additional traffic than does the broken line.

So far we have considered only a simple situation involving one type of switch. Inasmuch as switching at most yards involves many types of switch, each requiring different amounts of yard engine-hours, we must go one step further and develop a method of evaluating the cost in terms of yard engine time required to originate, terminate, classify and interchange cars, or perform other services. This information could be secured by time study, but time studies are costly, time-consuming, and leave doubt as to whether a really representative period has been studied.

In our calculations on the data presented in Table II we have related cars handled with yard engine-hours, that is, have found the correlation between the two variables. We could say that cars handled (an independent variable) cause yard engine-hours (a dependent variable) to be incurred. If we had two different types of switch, A and B, at this yard we could say that cars handled of "A" type switch plus cars handled of "B" type switch cause the yard engine-hours to be worked. The question is: "What time should be assigned to 'A' type switches as against 'B' type switches?"

To illustrate what can be done in such situations I have picked "South Yard" as an example, since it performs two distinct types of switch. Cars at this yard are removed from, or placed in, road trains and switched to or from two zones:

1. Commercial and Light Industry Zone in built-up area served by tracks crossing numerous streets at grade.

2. Heavy Industry Zone, relatively free of grade crossings, and in which the cuts of cars received and delivered is generally larger than those in Zone 1.

It is obvious from the above that it must take more yard engine time to originate or terminate a car in Zone 1 than it takes in Zone 2. The question is what is the average time required for each?

By making a correlation analysis through the method of least squares we relate:

1. Cars handled to and from Zone 1 and,

2. Cars handled to and from Zone 2 with,

3. Yard engine-hours.

Based on 24 observations the following yard engine-hours per car were determined. (See table below.) Plus a constant of .7 yard engine-hours per month.

The constant here is lower than is often obtained, but is not believed to be unreasonable, inasmuch as excellent utilization of power is available here through using shifters bringing in cars from nearby towns whenever yard switching becomes great. The test as to whether these calculated values are correct is to apply the values against the cars handled in the original data and see how closely they reconstruct the actual yard engine-hours worked. An "acid test" is to extend this test by applying calculated values to cars handled outside the original data and again see how closely the results compare with actual yard-engine hours. This is graphically done in Chart B.

Those who are mathematically minded might be interested in the following information regarding this example:

1. The coefficient of correlation in this example is .935. (A coefficient of correlation of 1.000 is perfect, about .75 is good.)

2. The standard deviation was 85

YARD ENGINE-HOURS PER CAR

	Yd. Eng. Hrs per car switched	Doubled to include handling of empty	Expressed in minutes per loaded car
Zone 1	.26575	.53150	31.89 min.
Zone 2	.20730	.41460	24.88 min.

yard engine-hours. (This indicated that 95 per cent of the time we can expect the actual yard engine-hours to be within 2 standard deviations, that is ±170 hours of the calculated hours. Expressed as a percentage of the average 2,532 yard engine-hours per month at South Yard, this indicates that 65 per cent of the time the actual yard engine-hours can be expected to be within ±3.4% of the calculated hours, and 95% of the time within ±6.7% of the calculated hours.)

Any number of independent variables (types of switch) theoretically may be related to dependent variables (yard engine-hours). As a practical matter no more than 6 or 7 should be used, because of the increase in work involved upon adding each independent variable. Thirty-six observations have been found sufficient to determine the pattern for as many as 6 independent variables.

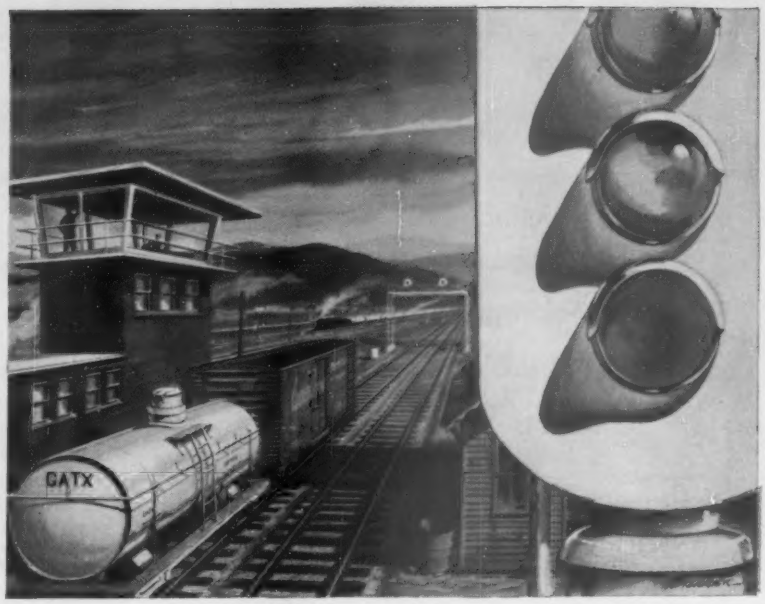
This approach is not limited to use in yard service analysis. It has been used successfully in such cases as relating:

1. Car-miles to train-miles to determine the incremental cost of a car-mile in terms of train-miles.
2. Gross ton-miles to train-miles to determine the incremental cost of 1,000 gross ton-miles in terms of train-miles.
3. Yard engine-hours to yard expenses to determine the incremental dollar cost per yard engine-hour.
4. Train-miles to train expenses to determine the incremental dollar cost per train-mile.
5. LCL tonnage to freighthouse wages to determine incremental cost per LCL ton handled.

In short, there is no limit to the relationships which can be measured by this method. Wherever dollars are used they should be expressed in terms of wages and prices at a particular time (or observation) in order to eliminate fluctuations due to price and wage changes.

In some instances—such as in small yards or on thin-density branch lines—an increase in traffic may not cause an increase in service. In such cases an increase in traffic constitutes improved exploitation of unused capacity, and, as far as short-range traffic is concerned, causes no increase in expense. However, at

(Continued on page 51)



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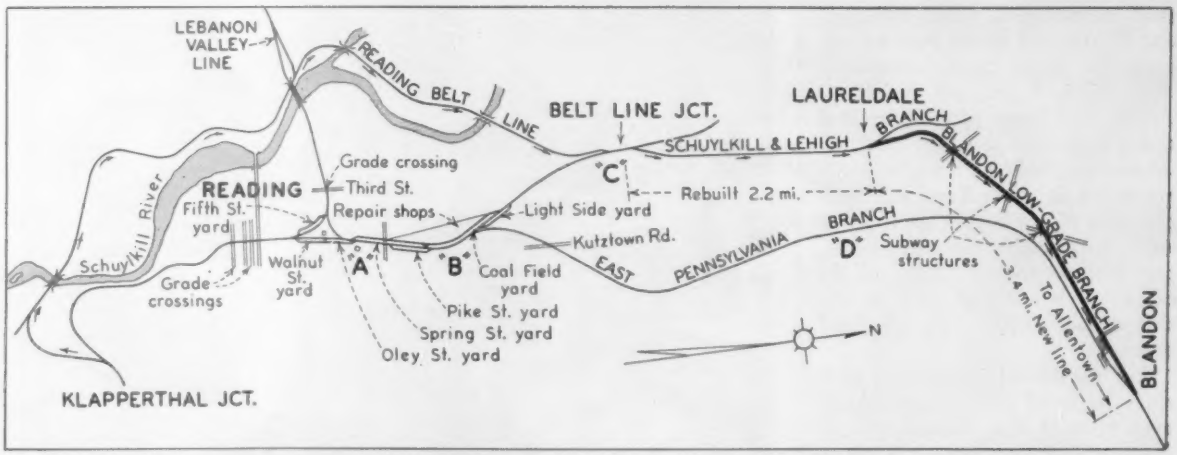


NEW ROUTE (arrows) will take rail traffic around the city of Reading on a low-grade line, instead of the former route through the congested urban district and up the steep grade of the East Pennsylvania branch, which required helper locomotives. The low-grade route is now 0.50 per cent, compensated for curvature, and was made possible by the construction of a new branch shown by the heavy line at right.

NEW BRANCH HELPS READING . . .

Get Set for Bigger Ore Shipments

Anticipating additional traffic this road has completed the first part of an overall plan to move trains around the city of Reading on a low-grade line and to consolidate its several yards at that point

A new line doesn't have to be long to produce important operating benefits. The truth of this statement is demonstrated by the Reading's experience with a new line only 3.4 miles long.

Called the Blandon Low-Grade branch, the new line connects the road's Schuylkill & Lehigh branch with its East Pennsylvania branch east of the city of Reading. With its completion the Reading not only has finished one part of a long-considered overall plan to improve its facilities at that point, but also has made it possible to effect substantial benefits.

For one thing, the line removes the last heavy grade from the entire eastbound route normally used to haul coal, iron ore, other materials needed for making iron and steel, and other freight, from the road's line west of the city of Reading to its yards at Allentown, Pa., and Catasauqua, two principal points of interchange with other railroads and its yards at Bethlehem. New ruling grade for the route is now 0.50 per cent, compensated for curvature.

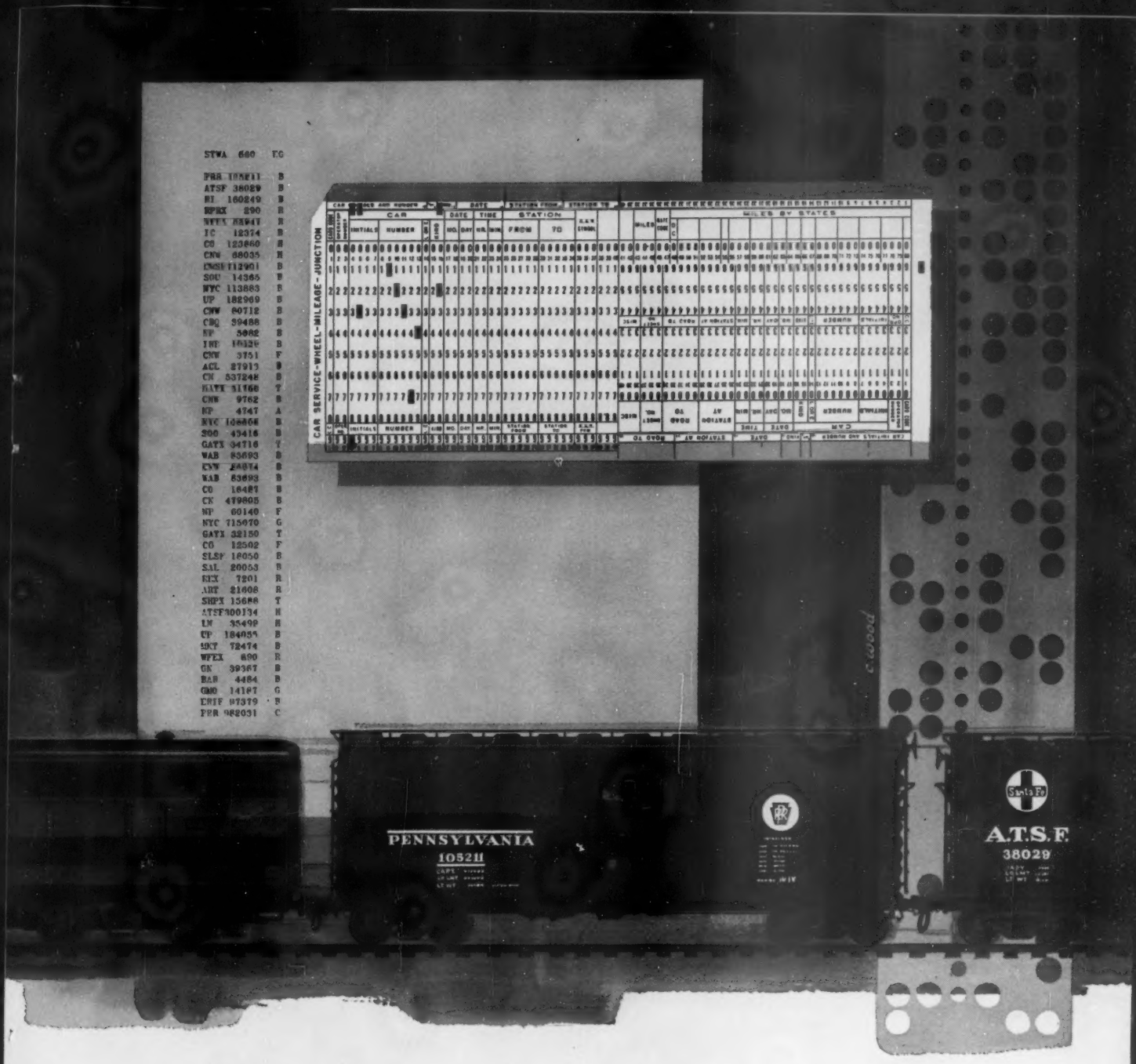
Before construction of the Blandon Low-Grade branch, eastbound trains had to be hauled up a 1.0 per cent compensated grade on the East Pennsylvania branch just east of Reading for about four miles. This move required the services of a helper engine and necessitated delaying each eastbound train at least 20 min while the additional locomotive was attached and an air-brake test made. The new low-grade line will permit tonnage trains to move eastward without the assistance of a pusher engine. About 37 per cent of all cars handled each day by the Reading come to, pass through, or leave from, the industrial area of Reading.

Much new traffic is expected next year as the result of the development by the Bethlehem Steel Company of an iron-ore mine at Joanna, Pa., about 20 miles south of the city of Reading. The iron ore will be used at the steel company's Bethlehem, Pa., plant, and will move over the Reading via the city of Reading. Moving this ore over the new low-grade line without the delay which would be caused by coupling helper engines, is important both to the steel company and the railroad, as well as to the defense of the country.

Street Crossing Problem

The new branch is also of importance to the city of Reading. Before construction of the new line, the normal route took eastbound trains not only through the congested yard area and up an unfavorable grade, but also over five important city streets. Since one of these is a crossing of a U.S. highway and two others are state highways, vehicular traffic was heavy. Passage of long trains caused vehicular traffic on these streets to halt

(Continued on page 50)



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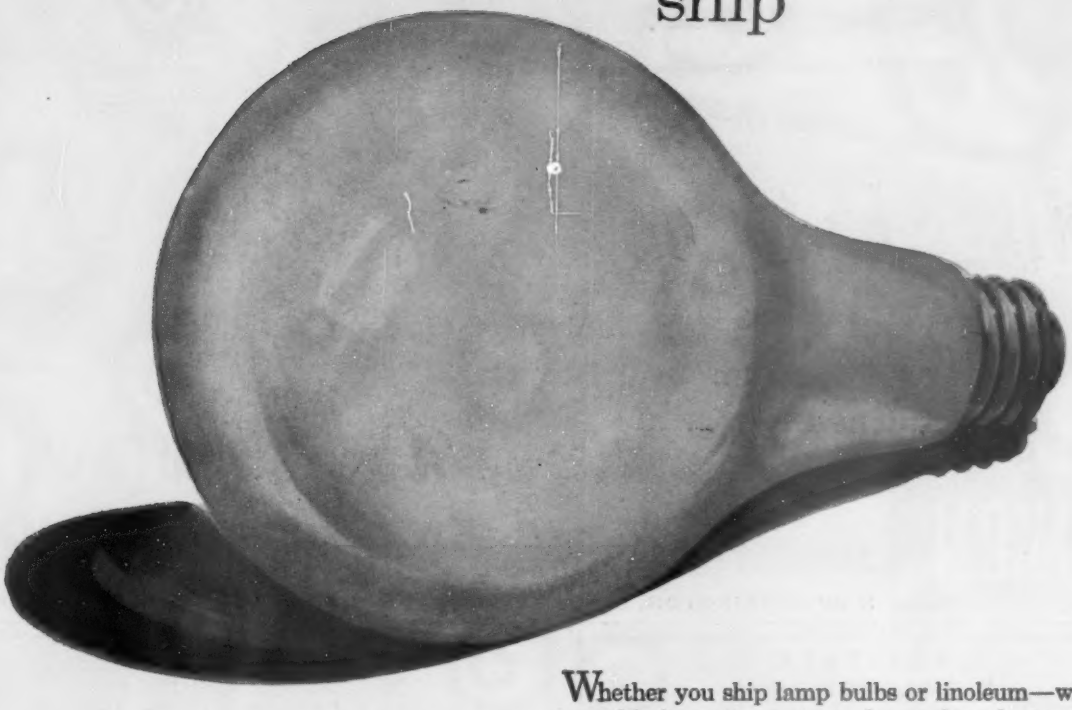

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D7 TRACTOR-NO. 70 SCRAPER ON GREAT NORTHERN ELIMINATES TRAIN HAUL FOR EMBANKMENT MATERIAL

The Great Northern extended two railroad sidings near Dutton, Montana—an industry track 763.6 feet and a passing track 3651.2 feet. Subgrading required moving 10,650 cubic yards of dirt from borrow pit to fill.

At the outset, it appeared that it would be difficult to get enough dirt from the borrow. Plans were made to bring in more than half the yardage by work train. Then the Great Northern put its CAT* D7 Tractor with matching No. 70 Scraper on the job.

Working most of the time without a push loader, the big yellow team was able to get all the dirt needed from the borrow. The work train was not needed, and the Great Northern saved considerable money.

And now the economy of these hard-working off-track Caterpillar units has been increased even more. The new D7 (Series C) has a new 128 HP engine with a drawbar pull of 28,700 lb. maximum. It has Caterpillar's exclusive oil clutch to give you more efficiency than ever. The new clutch increases work life since the constant oil bath lubrication reduces wear on all moving parts. There is less maintenance—1500 hours without adjustment is not unusual—and no external lubrication is needed.

Many models of Caterpillar-built Scrapers have been given the new, efficient LOWBOWL design which enables you to load more material in less time. In fact, all down the Caterpillar line, new models have been created and new refinements added.

It's time to see your Caterpillar Dealer. He has virtually an entire new line of money-saving off-track equipment to demonstrate—on *your* job.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

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NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

READING BRANCH . . .

(Continued from page 44)

and frequently to stand bumper-to-bumper for blocks, which elicited complaints from city authorities.

The anticipated increase in ore trains would have aggravated the situation. To avoid such aggravations, it would have been necessary for the road to route the ore trains over its Belt Line from Klapperthal Junction (see map, p. 44), to Belt Line Junction (point "C"), thence back to Pike (point "B"), and out over the East Pennsylvania branch through point "D" to Blandon. However, because of the length of the ore train, it would also have been necessary to couple a yard engine to the rear of the train when it arrived at Belt Line Junction, make an air-brake test, and pull the train into the yard until its head end had cleared the interlocking route to the East Pennsylvania branch near point "A."

To avoid blocking the four street crossings on the main line through the center of the city as it backed up south of point "A," the train would have had to be routed up the Lebanon Valley branch, where it would then have blocked the Third Street crossing. When the train had been backed up enough to clear the interlocking near point "A," a helper engine would have had to be substituted for the switching engine at the rear, and an air-brake test made, before the forward movement could be made over the East Pennsylvania branch to Blandon. As a result, vehicular and pedestrian traffic at the Third Street crossing would have been blocked not only while it was occupied by the ore train in its backward and forward movements, but also during the time it took for the engine change to be made.

This method of handling the ore trains would be highly objectionable from the railroad's viewpoint also, because, while the ore trains were making these moves, they would also have stopped movement of transfers and other trains in the Reading yards. The Blandon Low-Grade branch will avoid these operations.

The new branch also eliminates delays resulting from the former method of handling through trains. During the time required to attach a helper engine and make an air-brake test to an eastbound train, the train stood on tracks across the various freight yards and stopped the movements of other trains. Through trains can now be kept out of the yard area, thus permitting the free flow of traffic.

Another benefit to the railroad is that the new line also opens an entirely new area to industrial development away from city congestion.

The new line is an integral part of the road's overall plan to modernize its yard at Reading, because only through construction of the line is the yard project made practicable. The road now has in this area seven different yards where cars are switched and classified. It is proposed to consolidate them into one modern classification yard. This will eliminate inter-yard transfers of about 600 to 700 cars per day, and the dispatching of cars from four separate yards.

Were it not for construction of the Blandon Low-Grade branch, eastbound trains, which contain up to 150 cars each, would have to be backed up approximately 1.5 miles to clear the interlocking route in the vicinity of point "A" for movement over the East Pennsylvania branch. Such back-up movements would not only interfere with operations in the yard, and the movements of through trains, but would cause the rear ends of trains to extend over highway grade crossings and heavily traveled streets. Since back-up movements of these long trains could not be made by locomotives at the head end, pulling engines would be required at the rear of the trains, resulting in expensive operation and delays to trains and vehicular traffic.

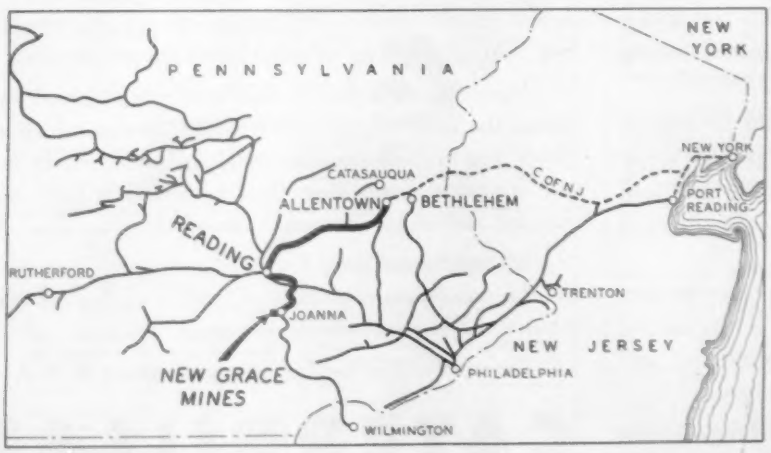
Facts and Figures

The Blandon Low-Grade branch leaves the road's Schuylkill & Lehigh branch at Laureldale and joins the East Pennsylvania branch at Blandon. About 0.70 mile of the relocated Schuylkill & Lehigh line was cut through rock as much as 25 ft deep.

About 460,000 cu yd of earth and stone were moved to make embankment fills of 350,000 cu yd. Four bridges were constructed to separate rail from highway traffic. Three of the structures are subways, and one is an overhead highway bridge of concrete and I-beams.

Because additional traffic is routed over a portion of the S&L branch to reach the Blandon Low-Grade branch, the Reading rebuilt 2.2 miles of the older branch line and changed the grade from 1.0 per cent to 0.50 per cent, compensated for curvature. Also, about a mile of the East Pennsylvania branch was realined west of Blandon.

Grading and bridges were constructed under contract and the railroad's own forces handled the track work. The project was carried out under the general direction of F. W. Biltz, chief engineer, and under the direct supervision of J. K. Fisher, assistant to chief engineer.



NEW TRAFFIC, consisting of iron ore to be hauled from Joanna, Pa., to Allentown (heavy line), is anticipated by the Reading after the Bethlehem Steel Company gets its new Grace Mines into operation.

COST FIGURES . . .

(Continued from page 43)

some undetermined density of added traffic, additional service will have to be provided. Thus, *for long range traffic calculations, the simple average cost should be used until an incremental pattern can be determined.*

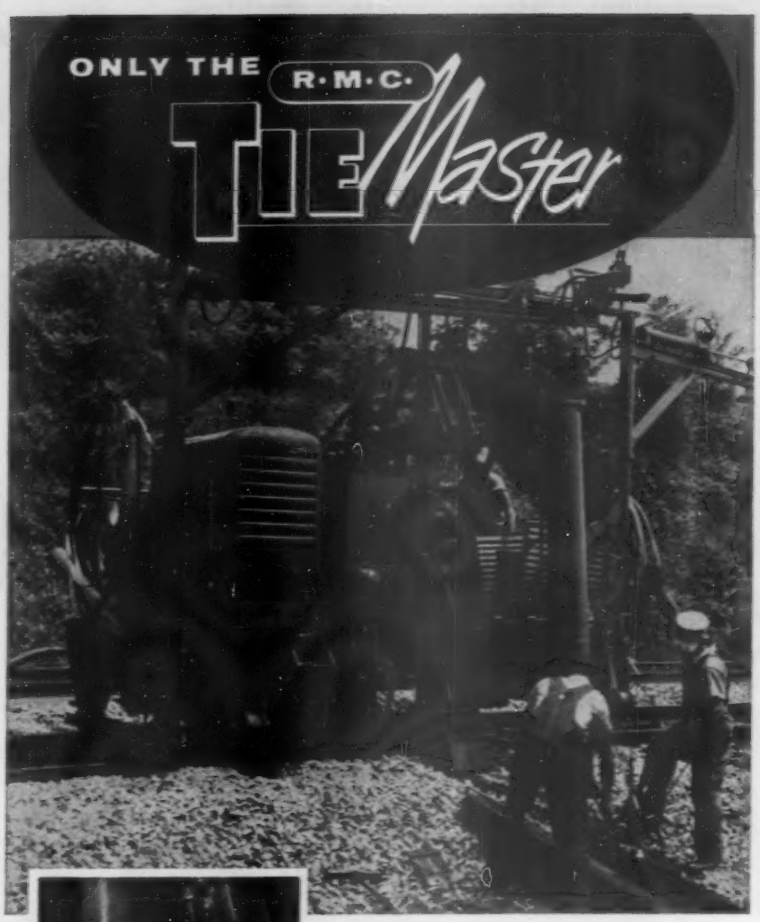
In some cases, there is no fixed cost (i.e., all costs vary with volume).

For example, in expressing cost per car-mile or ton-mile in terms of train-miles, wherever trains are dispatched 100 per cent on basis of tonnage—each train having its capacity load—there will be little or no fixed cost. Sometimes a "negative fixed cost" is found. This, in effect, indicates a change in pattern, and should be considered as an adjustment in the incremental costs. Wherever a negative constant appears, further study should be given to the selection of a representative period that more nearly reflects future conditions.

Normally, however, these calculations will result in determining a constant or fixed cost. This is a valuable piece of information to have, for it measures the extent to which there will be no increase in cost with increased traffic. In effect, this represents capacity which can be exploited through increasing traffic, and it is in this realm of unused capacity that railroads have a tremendous opportunity, compared to most other forms of transportation. Greater exploitation of unused capacity could permit the lowering of rates, where such reductions would capture added traffic; and, if this policy were vigously pursued, should result in greatly strengthening the railroads in their rightful place as economical mass movers of freight.

Cost determination through correlation analysis is by no means, of course, the answer to all cost problems.

It is, however, a valuable tool which can be used to solve many problems with less effort and expense, and with more reliable results, than other methods. It can also solve multiple relationship problems which could otherwise be solved only through expensive and laborious time studies.



Close-up of ram with pushing plate in contact with tie to be removed. Ram scarifies the bed while pushing old tie out, then draws new tie into position on return stroke.

DOES THE COMPLETE TIE REPLACEMENT JOB

In one operating cycle a single TieMaster performs these four steps—raises the track, removes old tie, scarifies the bed, and inserts new tie. Only the TieMaster performs all of those essential tie replacement steps.

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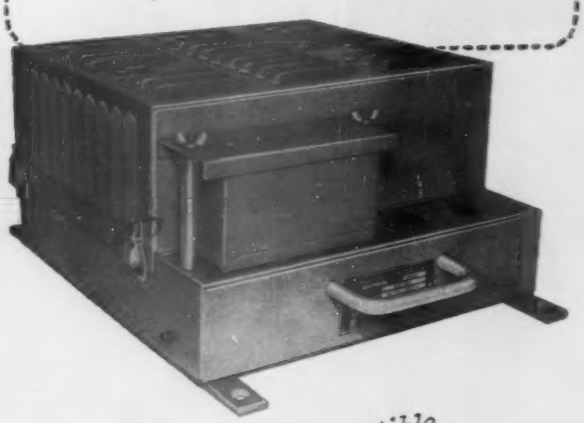

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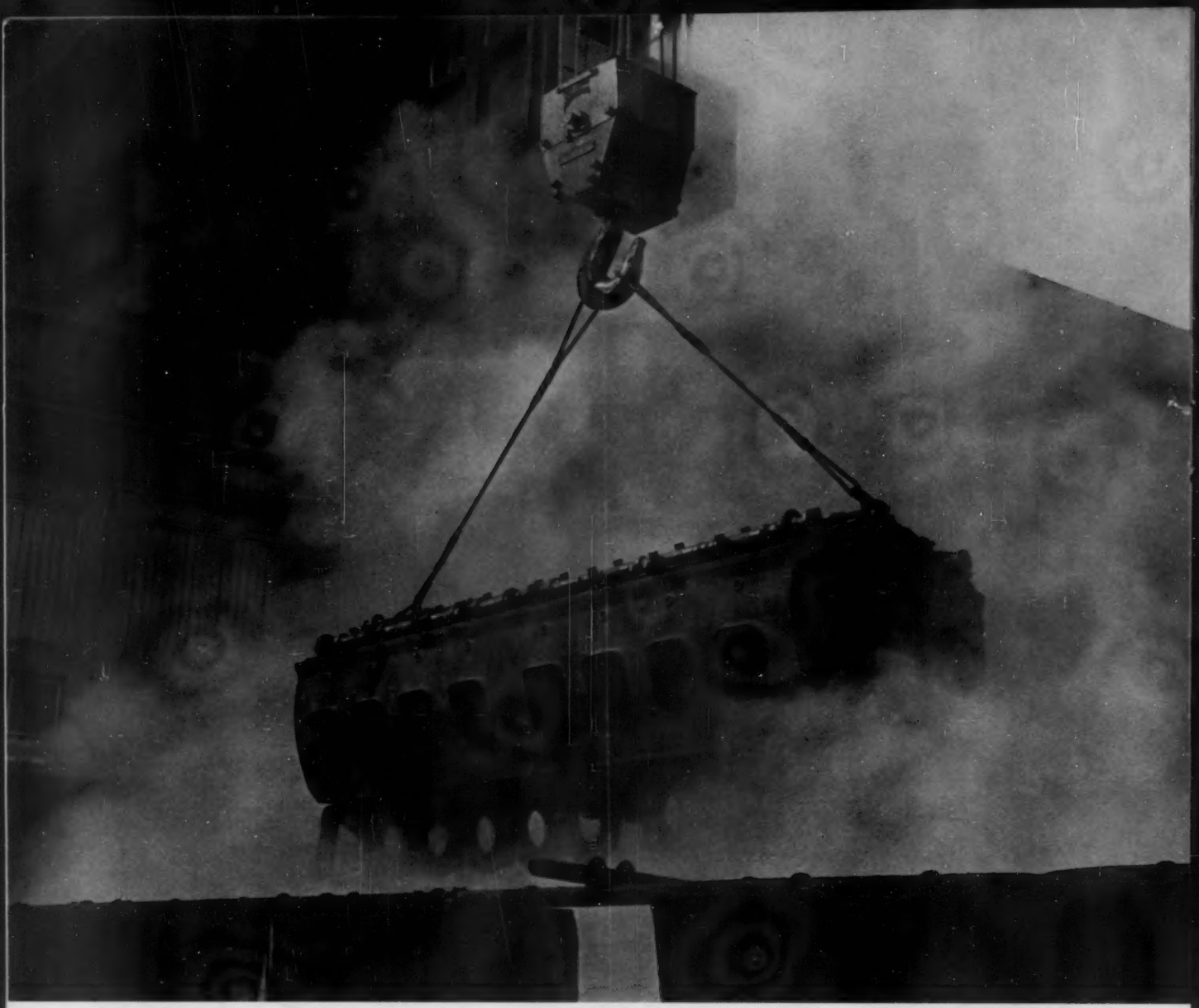

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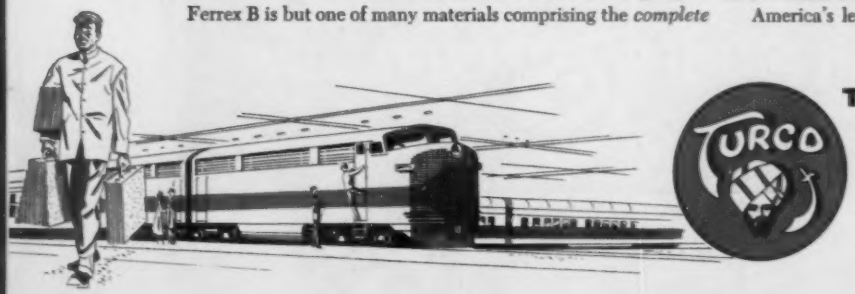
For Diesel Overhaul Cleaning...

it's FERREX B by TURCO

When the problem is the stripping of heavy deposits from diesel "A" frames and other parts, diesel operators the nation over have, for years, relied on Turco Ferrex B. The standard and accepted hot tank material for the cleaning of steel diesel parts, Ferrex B *quickly* and *thoroughly* removes the most stubborn soils...performs at peak efficiency over a remarkably long tank life...yet is used at concentrations lower than required by most hot tank cleaning compounds (only four to six ounces per gallon)!

Ferrex B is but one of many materials comprising the *complete* line of Turco compounds engineered *specifically* for railroad cleaning. Included in this line are acid and alkaline exterior cleaners, hot and cold tank cleaners, emulsion cleaners, electrical equipment cleaners, steam cleaners, rust removers and preventives, paint strippers, phosphate pre-paint treatments, dye penetrant flaw location materials, a full line of cleaning equipment, and many, many specialty products. This complete line, plus on-the-spot nationwide Turco technical service, stands as the main reason why, when it comes to *cleaning*, America's leading railroads turn to Turco... *first!*



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Railroad Division

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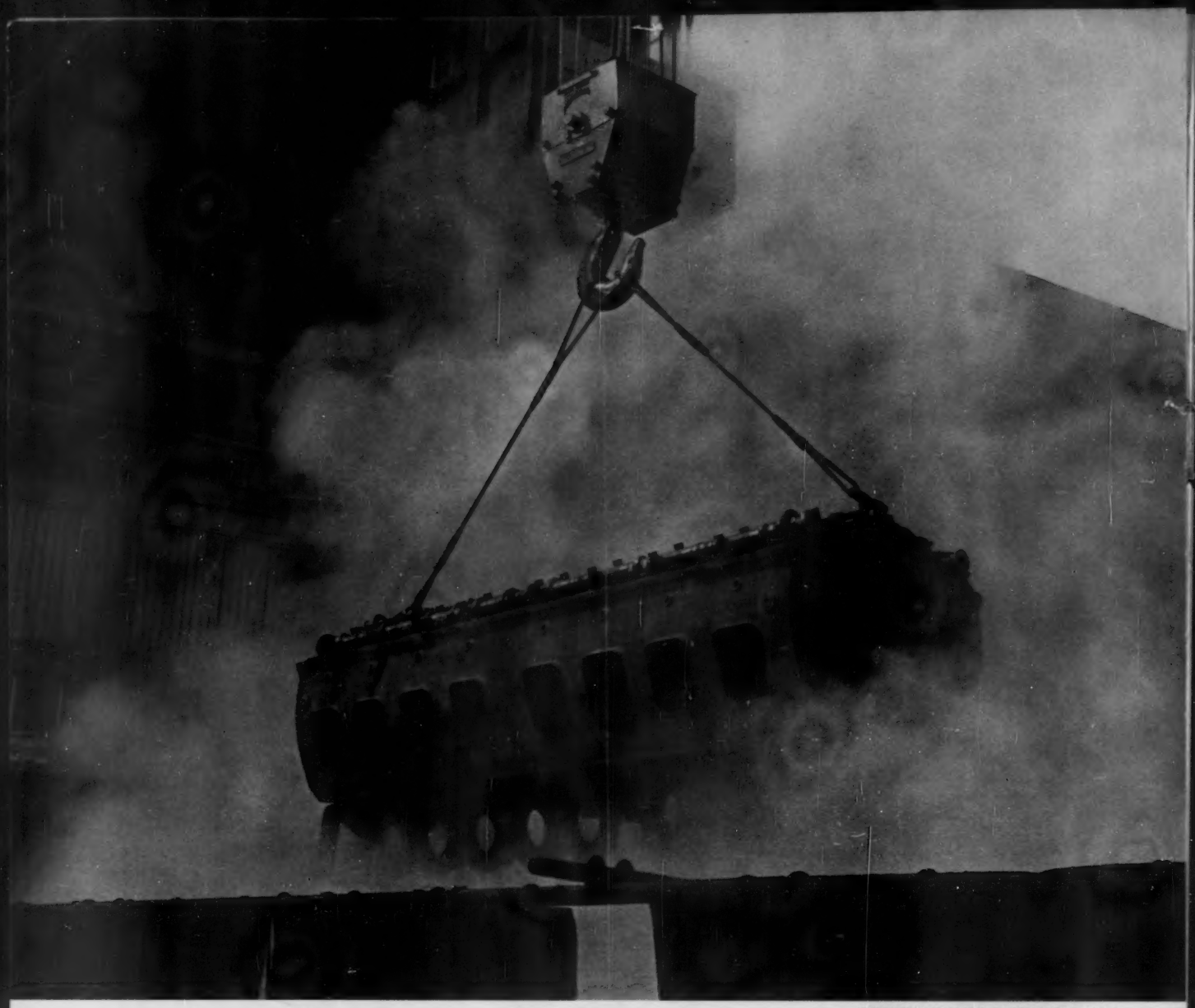

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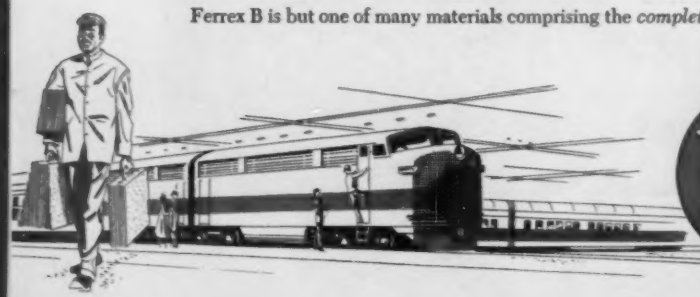

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